THE WELDING ENGINEER

JUNE, 1947

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A McGRAW-HILL PUBLICATION

JACKSON HOLDER **A-1**

To all intents and purposes . . .

In welding, as in all trades, it is the efficient and durable tool that saves costs in the long run. Over a million Jackson holders have proved themselves on the following points:

- Their *tong-type construction* grips electrodes instantly and firmly —and in any position. There is no need to bend the rods, and they may be used to short stubs.
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JACKSON HOLDER **A-3**

THE WELDING ENGINEER

THE WELDING ENGINEER, *with which is combined The Acetylene Journal*

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TOOL OF THE MONTH

ATLAS SYMBOL HAMMER

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(Suburb of Detroit)

ESTABLISHED 1916 — THE WELDING ENGINEER — JUNE, 1947

What Will Happen to Welding

THE REDUCED sales volume of the welding industry for 1946 was a reflection of lowered steel production. Steel production was off 19.8% from the previous year, while welding was off 19.3%. The close agreement between the two figures shows how imperative full production of steel is to our industry as well as to our national economy.

While past history is interesting, our greatest concern is with the future. From all indications, prospects are rosy. Of course, there always will be economic ups and downs. Nevertheless, on the basis of a long-range forecast recently completed by the 20th Century Fund* and abstracted in the May issue of THE WELDING ENGINEER, the future is extremely bright.

This research report finds that more people will be working, each producing more. They will, with resources available, turn out enough goods and services to meet almost all of the needs of consumers, capital investment and government. Our high standard of living will continue, together with high wages. Though the cost of living will be higher, we shall be able to enjoy greater leisure.

The welding industry fits ideally into such a picture. Greater production means, of course, that there will have to be greater use of welding. Electrical energy, which means more power for welding, is pictured as being up 65% by 1950, nearly 90% by 1960, over the 1940 capacity. This will undoubtedly end the conditions prevailing today in some rural areas where power companies threaten to discontinue service to the farmer who includes a welder among his appliances.

Demands for sheet-metal equipment for office, home and factory will be greatly increased. There is still a tremendous unfilled backlog for equipment of this nature, and it is the conclusion of the 20th Century Fund report that the demand will continue. For example, it is estimated that 4,000,000 refrigerators a year will be sold by 1960—11% ahead of 1941 annual production. Naturally, all of the welding processes are indispensable to the building of sheet-metal equipment.

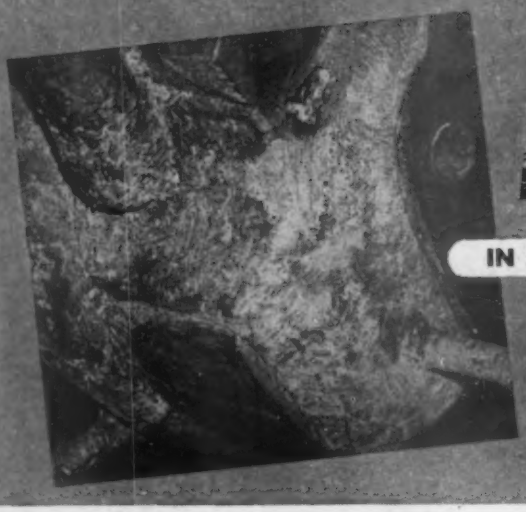
By 1950 a total of 36,000,000 automobiles are expected to be on the road—5,000,000 more than were in use in 1941. But it will still be necessary to make 5,000,000 cars every year, again a tremendous welding market.

When 1960 rolls around, the demand for every type of production is expected to be up at least 40% from the corresponding industrial activity of 1940. Business will be good, and welding, an integral part of the metal-working processes, will follow the general industrial trend. Barring wholly unforeseen disaster, the sale and use of welding equipment and supplies can hardly help but continue upward for the next two decades.

* U.S.A. 1950–1960, page 88a.

IN SHIPBUILDING...

for the repair and fabrication of such parts as stern frames, rudder posts, shafts and propeller struts. Saves casting and shipping of large pieces.



IN STEEL MILLS...

to repair, build-up and fabricate rolls, pinions, spindles, and housings and frames for various types of rolling mill equipment. Saves shutdown time and parts costs.

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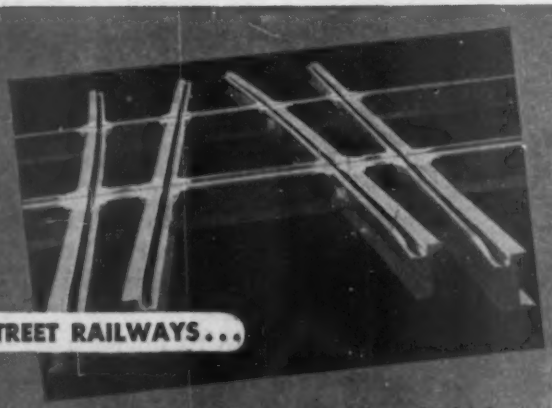
Send for the booklet, "Thermit Welding", containing complete details. Metal & Thermit Corporation, 120 Broadway, New York 5, N. Y., Albany, Chicago, Pittsburgh, So. San Francisco, Toronto.



FOR STREET RAILWAYS...

Railroads, Crane Rails...Joins rail joints. Also used to fabricate intricate pieces, such as frogs, mates, and crossings. Thermit welding lasts as long as track itself. Saves ripping up pavements, reduces joint maintenance.

FOR INDUSTRIAL EQUIPMENT...

an efficient, economical method for repair of crankshafts, drop hammers and other large parts; also for fabrication from multiple castings, forgings and flame-cut shapes.

THERMIT WELDING

★ CONSTRUCTION

Only 1,004 man-hours are required for all operations in the standardized construction of a one-story, steel-frame dwelling with three bedrooms.

BY A. N. CARTER
McGraw-Hill
Washington News Bureau

This attractive steel-frame house can be produced to sell for under $7,000. It is stuccoed and plastered, has a radiant-heating system and enough insulation to assure a warm indoor temperature in coldest winter weather

HOUSING on an Assembly Line

This article is one of the most thought-provoking we have ever published. It points a way—and perhaps the only way—to relieve our country's most desperate need, housing. It shows the right road to a building boom such as the United States has never known, to an era of new construction that will put an end to the no-housing bugaboo and give a $7,000 home to everyone able to finance it.

True, there are many difficulties to be overcome. But they are political and human difficulties, not technological. The know-how is already here. And if the ingenious methods of the Byrne Organization are ever adopted on a nation-wide scale, the resulting demand for welding equipment and supplies will be of wartime magnitude.—THE EDITORS.

INDIVIDUAL steel-frame houses of a new design featuring radiant heating are being constructed on a production-line basis for a large project located about 5 miles south of Baltimore near the town of Glen Burnie, Md. Methods have been perfected that permit more than 20% of the work to be done under roof. Only 1,004 man-hours are required to build a three-bedroom dwelling, including construction of the foundations.

Known as Harundale, the $7,500,000 development consists of 1,200 houses, about 80% of which are three-bedroom size and the remainder two-bedroom. All are one-story homes without basements. The project covers nearly 300 acres, including 64 acres of park area, 60 acres devoted to streets, 16 acres set aside as a shopping center and 5 acres alloted to a community center. The homes are all being built for sale, but management of the shopping site will be retained by the developers.

The reasons for the selection of lightweight structural steel shapes rather than lumber for the framework of the homes are:

(1) Steel lends itself effectively to precision cutting and production-line assembly; (2) the finished home will be fire-resistant; (3) construction will be more permanent; (4) cracking of wall plaster will be greatly reduced if not entirely eliminated.

Radiant heating was decided upon because this system is expected to provide more uniform heat than conventional systems and at the same time save floor space.

SALE PRICE BELOW $7,000

In present days of fantastic house prices, it seems almost unbelievable that these modern homes are designed to sell for less than $7,000, including a 60 by 100 ft lot. The three-bedroom house measures 26 by 38 ft and provides nearly 1,000 sq ft of floor space. The accompanying plan, Fig. 1, illustrates the general layout. This floor plan is for a 36-ft house and so differs slightly in dimensions from the 38-ft houses now being built.

The plan for the two-bedroom home, which is priced at about $6,500, is similar.

In designing these dwellings, the aim was to obtain a home with good heating and insulation characteristics that could be built at moderate cost. The design selected calls for a reinforced-concrete floor slab 4 in. thick, put down on a 6-in. sand fill and supported along all edges on a 12-in.-wide grade beam that is carried down to firm

Fig. 2—Assembling the subpanel sections to make a complete wall. This work is done in a large Quonset hut

Fig. 3—Roof trusses are prefabricated in another Quonset hut. Sheet-steel channels and steel rods are used

material. All of the radiant-heating piping is embedded in the floor slab; this piping consists, for the most part, of ½-in. copper pipe laid out in grid form with 16-in. spacings.

The principal framing of the exterior walls consists of steel studs 3¾ in. wide and spaced on 2-ft centers. These studs are made up of 16-gauge sheet metal and grooved at either side to permit nails to be driven into them. These V-grooved studs may be seen in Fig. 2. On the outer side, the wall framework is covered with a 1-in. thickness of fiberglass insulation, then light-weight wire reinforcing mesh backed up with heavy paper and finally stucco. To the inside face of the studs are added a paper vapor seal, metal lath and three coats of plaster.

An exception to this type of wall construction is in the gable ends, where aluminum siding is substituted for the wire mesh and stucco. For a number of homes, all of the exterior walls will be surfaced with aluminum siding, while with still other structures the exterior surfacing will be asbestos siding or brick veneer

Steel Roof Trusses

The roof framing consists of lightweight steel trusses on 2-ft centers (Fig. 3). The compression members of the trusses are U-shaped and made of 16-gauge sheet steel, while the tension members are rods. The largest rod is ⅜ in. in diameter.

The roof is surfaced with ½-in. thick plywood, building paper and asbestos shingles. The ceiling calls for metal lath tied to the lower chords of the roof trusses and then plaster. The interior partitions are made of 16-gauge metal studs, like those used for the side framing, with metal lath and plaster on either side. The doors are of wood, and the windows are of steel casement design with inside screens. An individual oil-fired heating unit is provided for each home, and a 140-gal oil storage tank is installed as part of the system.

This design is permitting much of the construction to be done on an assembly-line basis. The possibility of doing the prefabrication work at other than the construction site was studied but had to be rejected because of the expensive

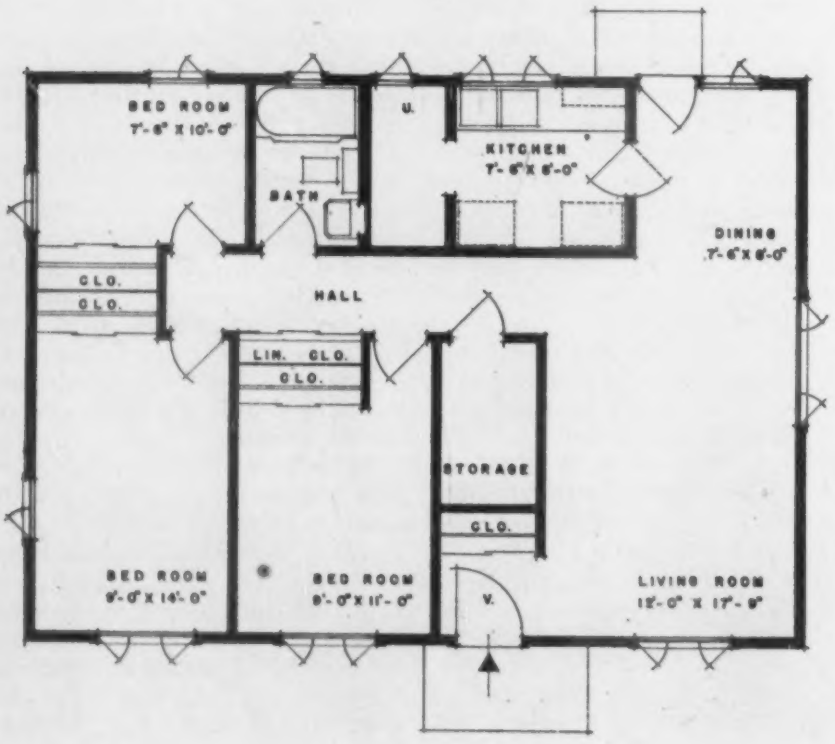


Fig. 1—Floor plan of the three bedroom house. Some of the dimensions are slightly in error as this plan is for a 36-ft house and a 38-ft house is now being built

Courtesy, The Nelson Stud Welding Corp.

Fig. 4—Fiberglass insulation, tar paper and metal lath are held in position by the round-headed pins stud welded to the steel framing. On the far side of this wall, metal lath for the interior plaster is being affixed

Fig. 5—The roof trusses are prefabricated on low jig tables and stored in a stock pile for later assembly

transportation of large sections for long distances and the frequent delays and interruptions that might be encountered because of transportation difficulties. Also, it was felt that changes in design and in the scheduling of the work, necessary because of variation in material deliveries or other reasons, could be made most effectively if all of the prefabrication work was done on the job.

To provide space for this work and for storage of materials, nine Quonset huts were purchased and erected at the construction site. The two largest huts are each 180 ft long by 40 ft wide. One of these larger huts was assigned for assembly of the wall sections and another for production of the entire roof.

Full-Sized Walls Assembled

Construction materials arrive by rail and truck at the outer end of the first row of huts. The steel shapes for the wall and roof framework are delivered through the end doors of the huts to fabrication stock piles conveniently located to the start of assembly. The long steel sections received from the mills are passed down the saw table and cut into the various lengths required for truss members and wall panels. Dimensioning and placement of the various members is accurately controlled by precutting and by assembly on jig tables.

Assembly of the framework of the wall sections is accomplished on horizontal tables serving as jigs. Blocks, guides and clamps hold each member in accurate position for welding. Subpanels of the framework, including the window casements, are assembled on the first jig table. The completed subpanels, of which the largest measures about 8 by 8 ft, are moved by hand to a larger assembly table (Fig. 2), where the framework for the entire wall is completed.

The assembled wall is raised into a vertical position by a steel channel secured temporarily at one side and moved forward by an overhead electrical hoist to one of three racks. Here the insulation and stucco reinforcing are applied on one side and the tar paper and metal lath on the other. The metal lath is held in place by large, round-headed pins affixed to the structural studding by stud welders (Fig. 4). The finished walls are moved outside the hut by the overhead electrical hoists and placed on a large flat-bed trailer with a special frame designed to carry two end walls and two side walls at each trip.

The normal crew working in the wall shop consists of an assistant foreman, a saw operator and two helpers who cut the steel shapes to lengths, six weldors employed at the subpanel tables, seven weldors and an equal number of helpers to assemble the large wall sections. The crew finishing the wall panels consists of another assistant foreman, four operators for the stud welding guns that secure the insulation and the stucco reinforcing, two cutters to prepare the necessary materials and twelve workers to nail the materials in place and shift the wall sections. These two crews normally produce the four wall panels for a house in an hour. The larger of the panels weighs about 1,200 lb.

Roof Production

As the first step in production of the roof, the trusses are fabricated on low tables (Fig. 5). As soon as welding is finished, the jig lugs are released and the finished truss is

Fig. 6—With the welding of braces and ties, the truss assembly becomes a rigid framework for the roof

placed on a stock pile for assembly into the roof section. The usual procedure is to keep on hand sufficient trusses for about two complete roofs.

The first step in roof assembly is to set the prefabricated trusses on two roller conveyors spaced sufficiently far apart to keep the ends of the trusses directly over the conveyors. A lightweight longitudinal steel bearing plate is added under both ends of the trusses. The plates are welded to the trusses after the latter have been brought to the desired position by means of guides located just outside the conveyors. The diagonal end braces and stay braces are next added (Fig. 6), along with the vertical studs for the gable ends. An opening is left for the preassembled chimney frame to be welded to the steel truss.

With the welding of the braces and the ties, the roof assembly becomes a rigid unit (Fig. 7), which is rolled forward along the assembly line to the second position for completion of the chimney and addition of the plywood for the roof. In a third position, the roofing paper and asbestos shingles are put on. Finally, the assembled roof, which may weigh as much as 4½ tons, is rolled to the end of the conveyors, and sling cradles are attached at either side. Two overhead electric hoists pick up the roof and place it on a trailer (Fig. 8) equipped with a special wide bed of steel I-beams.

Table I. Breakdown of Man-Hours for Three-Bedroom House

Shop Man-Hours	
Roof	55
Walls	45
Plumbing	20
Heating	17
Carpentry	45
Other	25
Subtotal	207
Site Man-Hours (including foundations)	
Coils and slab	125
Walls and roof	25
Partition framing and lath	65
Plaster	225
Plumbing and heating	47
Painting	60
Other	250
Subtotal	797
Grand Total	1,004

Fig. 7—Conveyor rollers carry the roof framework forward to receive plywood. Roofing paper and asbestos shingles are added at another station

Fabrication of the trusses is accomplished with four weldors and six helpers, while three weldors and four workers are needed to assemble the trusses into the roof framework. Eight carpenters and four helpers apply the decking, and six carpenters and three helpers add the shingles and complete the gable ends. One complete roof section is produced each hour.

Pipes Also Preassembled

With the aid of large templates, the copper piping for the heating system is assembled in another one of the Quonset huts by production-line methods. The three-bedroom house needs a total of 795 ft of copper piping—600 ft of ½-in. diameter, 170 ft of ¾-in. pipe and 25 ft of 1-in. diameter. The pipes are bent as they are placed in the templates. The piping needed for one house is assembled in seven large sections with soldered joints. The crew for this work consists of one man doing the soldering, two cleaners, one man to place the pipes on the templates, one bender's helper and four other workmen. This nine-man crew can assemble the pipe for one house in about an hour.

For ease in transporting the heating system to the field, the various sections of pipe grid are tied to light timber frames. Pipe assemblies from boiler to grid outlets, to expansion tank and to the domestic water tank are made up in the shop to eliminate as many field connections as possible. After the complete grid has been assembled at the site, it is tested at a pressure of 300 psi before it is embedded in the floor slab. The heating system is designed to produce a floor temperature of 85 F when water with a temperature of about 135 F is circulated.

The piping for the plumbing system is preassembled in another building. Frames or jigs are used to permit almost the entire system to be assembled in one piece. The eight-man crew doing this work is made up of three helpers and two workmen.

In still another shop the electrical wiring is attached to the junction boxes or outlet boxes. Many of these boxes are installed when the wall sections are assembled, and the remainder are added in the field while the interior partitions are being built.

Probably the most time-consuming task that must be done at

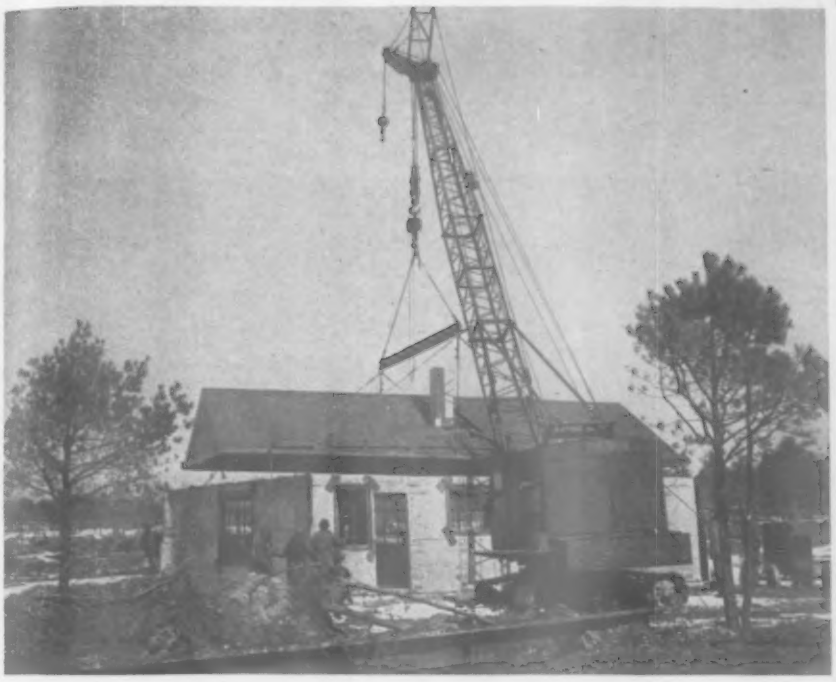


Fig. 9—A crawler crane with a 45-ft boom is used to lower the roof in place. Then the ends of the roof trusses are welded to the wall studding

the erection site is the construction of the floor. The grade beam is built as a first operation, followed by addition of the sand fill, which is sprinkled and compacted with hand tampers. A single layer of 6 by 6 in. No. 6 reinforcing mesh is installed beneath the heating grid. Once the concrete has been poured over the entire floor, the mesh and the heating coils are raised to the center of the slab to keep the pipe from bearing directly on the sand fill. A concrete designed for a 28-day compressive strength of 3,000 psi is used. It is delivered with truck-mounted mixers and finished by gasoline-powered rotary finishing machines.

Field Erection

Erection of the four walls and roof for a dwelling requires only about 40 minutes. A crawler crane with a 45-ft boom is used. The side walls are first erected and are tied together at either end with a steel strut and two diagonal cables equipped with turnbuckles. Next the end walls are applied, followed by the roof. The roof is lowered the last few inches by a chain hoist mounted in the six-point pick-up used to handle the roof (Fig. 9). To tie the walls to the grade beam, ¾-in. bolts are provided on about a 3-ft spacing. The bearing plates previously attached to the bottoms of the trusses interlock with the tops of the studs in the side walls, and the roof is tied to the walls by welding the ends of the trusses to the studs.

When the roof is in place, the metal lath for the ceiling is attached to the lower chords of the roof trusses and the partitions are installed. Crews following closely behind do the plastering work and add the stucco on the outside. After the ceiling has been plastered, sufficient glass wool is blown into the attic to provide a 4-in. layer of insulation over the ceiling. Completion of the home is by conventional methods of plastering, trim, painting, glazing and flooring. Garages and porches will be provided at extra cost.

Time studies show that with the methods described one of the three-bedroom structures is built with 1,004 man-hours. A breakdown of the time is given in Table I. It is to be noted that more than one-fifth of the man-hours are spent in the assembly shops.

A total crew of about 500 is employed on the project, and a 40-hr week is being worked. With this force, four or five homes are now being built each day. Once all the required materials are readily available, however, it is expected that ten houses can be constructed daily. The houses are to be held for veterans during construction and for 60 days after the completion of each home.

The Harundale project is being financed and constructed by the Byrne Organization, Washington, D. C. This firm also plans to operate the shopping center. E. J. Curry is project manager and A. B. Petersen general superintendent for the Byrne Organization.

Fig. 8—The completed roof section may weigh 4½ tons. It is picked up by overhead hoists and set on a flat-bed trailer for delivery to the site

Bench-Welded

Fig. 1—An innovation in watchmaking is the Elgin spot-welded mainspring assembly. Tests show this construction is more rigid and 100% stronger than the older method of joining the brace and barrel end of the spring by a wire rivet

Fig. 3—The Durapower mainspring and 15 jewels were all that was left of a watch movement after a 12-minute bath in nitric and hydrochloric acids

Working with strips 0.0043 and 0.0035 in. thick, the research laboratories of the Elgin National Watch Co. found that spot-welded joints were just twice as strong as riveted ones. Welding is now a production operation on the new "Durapowered" Elgin watches.

BY CLYDE B. CLASON

PRODUCTION of a new weldable alloy for watch mainsprings has been hailed by some authorities as the most important advance in watchmaking since the introduction of jewel bearings way back in the year 1704. Research scientists of the Elgin National Watch Co., Elgin, Ill., worked for 12 years on the project of evolving a product superior to the conventional carbon-steel mainspring before they finally developed an alloy having all the required properties.

Appropriately christened "Elgiloy," this new metal is hard, tough, ductile, of great tensile strength and highly resistant to corrosion. Other possible applications for it in industry may include the manufacture of stainless cutlery, surgical and dental instruments, springs of various types, automotive parts and the components of electronic tubes—and uses in whatever place requires chemical and heat resistance in a very hard, tough material.

SPOT-WELDED MAINSPRINGS

Any or all of these developments may come later. At present Elgiloy is only being used for the newly devised "Durapower" mainspring that will be found inside the latest types of Elgin watches.

Manufacture of a watch mainspring is one of the world's most finicking processes. The assembly consists of the spring and brace, the latter being attached to the barrel end of the spring by means of a spot weld made on a small bench welder (Fig. 1). In ordinary carbon-steel mainsprings, the barrel end of the spring and the brace are pierced and held together by a wire rivet. Welding of the brace assembly, Elgin's second innovation in mainspring making, is by far the superior method.

Watch Springs

Fig. 2—A carbon-steel spring and one of Elgiloy were sealed together in a jar with enough water to insure relative humidity of near 100%. This is how they looked after 18 days. The carbon-steel spring (right) has disintegrated into several brittle, rust-encrusted sections

Fig. 4—This machine cuts exact mainspring lengths and pierces the tiny arbor and barrel hook holes

Repeated shear tests have shown that the strength of the welded assembly is approximately twice that of the riveted one. The load necessary to pull the brace from a man's wristwatch spring averaged 18.9 lb for the welded, 9.7 lb for the riveted assembly.

Members of the Elgin research laboratories claim many other advantages for their new mainspring. They will tell you that it is 100% rust-free under conditions of high humidity, that neither salt sprays nor perspiration harm it, that it cannot be magnetized and that it is only one-half as likely to break from repeated flexing as the best steel mainspring that can be made. Furthermore, they say, it is able to maintain its resilience indefinitely, while carbon-steel mainsprings frequently lose as much as 20% of their original strength.

"More than half of all watch movement repairs are traceable to mainspring trouble," George G. Ensign, Elgin's director of research, testified at a recent press conference. "The ordinary steel spring 'sets' and thereby loses its watch-running power, or it rusts and breaks."

Resists Rust, Acids

The Durapower spring's resistance to rust was proved by a simple laboratory test. Two mainsprings —one of carbon steel and the other of the new Elgiloy—were both placed in a covered flask containing sufficient water to insure near 100% relative humidity. Fig. 2 shows how they looked when they were removed 18 days afterwards. The carbon-steel spring has disintegrated into small, brittle sections encrusted with rust barnacles. The Durapower spring (left of picture) was rust-free and as good as new. Even in a salt spray, it showed no rust after 500 hours.

Another dramatic demonstration of the new alloy's chemical-resistance was made by Research Director Ensign. He lowered the entire movement from a wristwatch into a flask containing a hot solution of nitric and hydrochloric acids. The combination of these two acids constitutes one of the most voracious and greedy solvents known to chemical science. The watch movement was left for 12 minutes in this hell brew, and then the flask was emptied. Fifteen tiny jewels and the Durapower mainspring were all that remained (Fig. 3). The mainspring, however, was as good as new; it had not been affected in any way.

Because of the new alloy's extreme hardness and toughness, entirely new techniques had to be developed to polish and process it. The narrow band of Elgiloy metal, as it comes from the mill, is first fed into a slitting machine to be cut into the proper widths within tolerances of 0.0001 in. These

Fig. 5—The coiled springs are lowered into this furnace for heat treating

long ribbons of alloy are polished to the necessary smoothness and then fed through a second cutting machine (Fig. 4), which not only cuts them to the exact lengths but also pierces the tiny arbor and barrel hook holes at opposite ends of the spring. The barrel hook hole will later be used in the alignment of the spring and brace for spot welding.

When the springs have been formed, they are lowered into a furnace (Fig. 5) for heat treating. They are then tested individually for thickness on a specifically designed gauge. Springs which are over 0.0001 in. too thick or too thin are immediately rejected.

The springs which pass their first inspection are placed on another machine, which "unwinds" them from the coiled shape in which they were heat treated and coils them in the opposite direction. This reversal increases the spring's strength or torque. Since the springs are fed through the machine separately, the opportunity is afforded for a second inspection.

Welding Procedure

After its surface has been cleaned and polished, the spring is ready for spot welding. As an example of the dimensions involved, the 15/0-1 mainspring is 0.0043 in. thick, and the brace is 0.0035 in. thick. Welding current magnitude and time are both critical, and the use of electronic control equipment is, of course, indispensable to effect a satisfactory weld.

Location of the brace on the spring is also of prime importance. Elgin designed and made templates (brace nests) for holding the brace and at the same time aligning the spring in the proper location directly over the brace. The nest is incorporated as part of the lower electrode, as may be seen from Fig. 1. The lower electrode also has a tungsten insert in the copper template.

The upper electrode, which has the conventional type of tapered point, engages the spring and brace assembly at the point where the rivet was formerly placed. Elgiloy metal lends itself very well to this type of welding, and it is not necessary to anneal the finished weld.

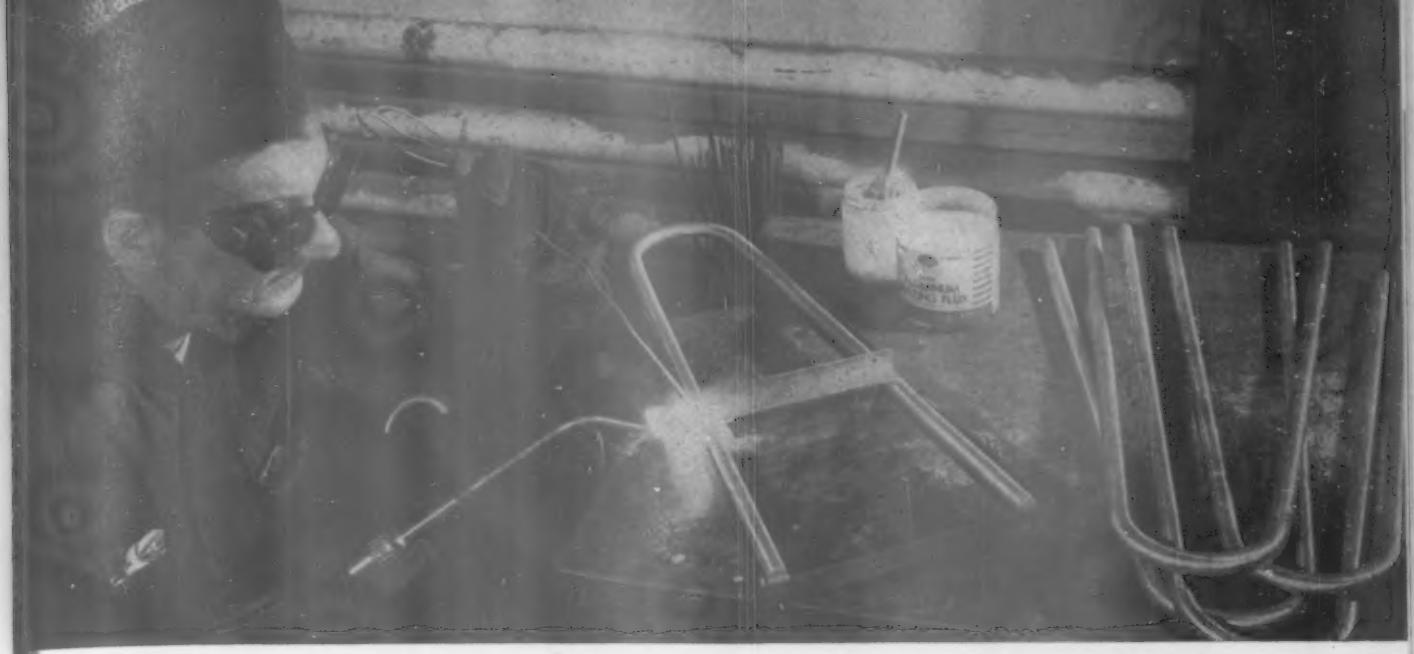
Voltage, weld-cycle time and electrode pressures must be held within close tolerances. The desired weld, according to R. S. Neidigh, of Elgin research laboratories, is one that produces a satisfactory bond with the minimum amount of electrode disfiguration to either the brace or spring surfaces.

Thousands of carefully supervised tests have been conducted in the Elgin laboratories to determine the mechanical and other properties of Elgiloy metal. Its ultimate tensile strength is given as 368,000 psi (as compared to 340,000 psi for spring steel), yield strength 280,000 psi, proportional limit 233,000 psi, modulus of elasticity 29,500,000 psi and Vickers hardness number 702.

☆ ☆ ☆

Flame-Cutting 22-In. Steel

To replace a broken casting on a horizontal bending roll, this 8½-ft, 600-lb blank for the bearing yoke and screw was flame-cut at By-Products Steel Corp., Coatesville, Pa., from a 22-in. slab of carbon-molybdenum steel. Machined size at the bearing cap is 2 ft 3 in. by 1 ft 7⅜ in.



Torch Brazing Aluminum-II

The possibilities of torch brazing as a method of joining aluminum are well worth investigation. Latest developments in the process are given here.

★ PRODUCTION

BY HARRY HUFF

Welding Specialist,
Air Reduction Sales Co.

This two-part article is one of the meatiest discussions of aluminum brazing that has ever come our way. Last month, in case you missed it, Mr. Huff covered the advantages of the torch process, types of aluminum alloys, joint strengths and corrosion resistance, design considerations and the use of jigs, fixtures and positioners. The present and final installment takes up in detail each of the four major steps in the torch brazing of aluminum, briefly surveys production methods and gives a list of products which may be fabricated by this method.—THE EDITORS

THE torch brazing of aluminum involves four major steps, none of which can be slighted without detriment to the final result. These steps are:

(1) Prebraze cleaning;
(2) Fluxing;
(3) Flowing the filler metal;
(4) Postbraze cleaning.

I. PREBRAZE CLEANING

Aluminum cannot be successfully brazed unless the surfaces to be joined are free from dirt, grease and oxides. Such foreign substances tend to show up as discolorations in the completed joint or to cause other difficulties. Furthermore, costs are likely to be increased if the surfaces are not thoroughly cleansed because dirty metal, in general, requires the use of more or stronger flux, more filler metal and higher operating temperatures.

Cleaning may be done by either chemical or mechanical means. If the aluminum has previously been degreased, mechanical cleaning with steel wool, fine sandpaper or a file may sometimes be adequate, but the more thorough chemical cleaning is recommended wherever the necessary facilities are available.

(Headpiece). Flowing the filler metal. The operator has brought the edges to brazing temperature and is now introducing the filler wire. He is fabricating the combination leg and hand-grip of a Solar "step-up"

CLEANING PROCEDURE

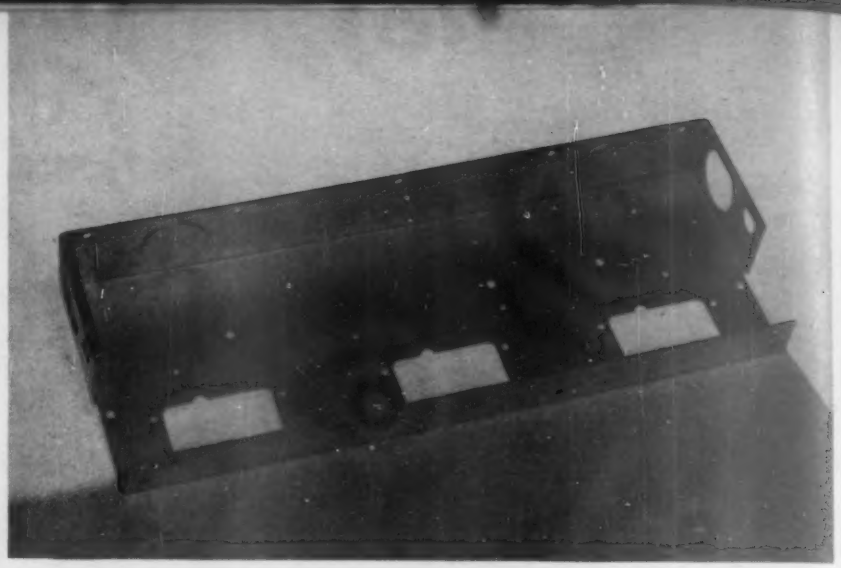
(*a*) Dip the parts to be brazed in a 150 F bath of sodium hydroxide (caustic soda 5%) for about 10 to 30 seconds;

(*b*) Rinse in clear water at about 150 F;

(*c*) Dip in 10% nitric acid solution at about 150 F for about 10 to 30 seconds;

(*d*) Rinse in clear water at 150 F.

The cleaning solutions given above react chemically with aluminum. Hence the parts should not be held in solution longer than the stated intervals, especially not where dimensional tolerances are close.



The brazed aluminum radio chassis on the right is a good example of an item for production torch brazing

The completed "step-up" (below) is a product of the Solar Craftsmen Furniture Co., Inc. The angles on which the horizontal section is resting were torched brazed to the legs **(see picture on page 45)**

Because of the rapidity with which aluminum oxidizes, the cleaning should be done not more than 36 hours before brazing. A longer interval may make a recleaning advisable. The cleaned parts should be stored in a dust-free place and not handled with bare fingers or with dirty gloves or tools prior to brazing.

Step 2. Fluxing

The flux should be stirred each time it is used so as to assure that the chemicals in it are thoroughly mixed. It is usually applied by brush and should be brushed evenly on the edges to be joined. Care must be taken to see that the edges of the parts are entirely covered.

The filler rod should also be fluxed. Preformed and preplaced alloy material should be flux coated before it is set in position.

As in the torch brazing of steel or copper with silver-brazing alloys, the flame is not applied directly to the filler metal but to the metal to be joined. The latter is heated until it reaches the right temperature whereupon it assumes the role of a "soldering iron" and is then used to heat the filler metal. The following factors must be taken into account:

(*a*) The high heat conductivity of aluminum. Areas near the brazing zone must be adequately preheated in order to prevent too rapid conduction of the heat to cooler sections of the metal.

(*b*) The low melting point of aluminum. Since aluminum melts at a temperature only slightly higher than the melting point of the filler metal, great care must be taken to avoid overheating.

(*c*) Aluminum does not change in color or give other visual indication of its temperature in passing through the various stages of heating.

Step 3. Flowing Filler Metal

In flowing the filler metal, the flame is first played outside of the brazing area and progressed steadily toward the line of juncture, giving somewhat more emphasis to heavier or thicker sections. This procedure is continued until near-brazing temperature is reached, a condition which will be indicated by the liquefaction of the flux.

When the flux liquefies, the heat is concentrated along both of the edges to be brazed, which are brought up in just a few seconds to the temperature required for flowing the filler metal. The exact interval required will be fairly easy to judge after a few practice joints have been made.

The filler metal (unless it has been preplaced in the joint) is now brought into contact with the edges to be brazed. No more heat is applied than is necessary to keep the filler metal flowing until it has penetrated into all crevices of the joint. No more filler metal is applied than is necessary to fill up the space between the joint edges; no reinforcement or extra layers are added as in welding.

Throughout the entire operation, the flame is never played directly on the filler metal nor is it held stationary over any one spot.

In production applications using multiflame burners and continuously moving conveyors, the filler metal is practically always preplaced. The heating is controlled by the number of flames or sizes of tips, by positioning the flames and by adjusting the speed of the conveyor.

Step 4. Postbraze Cleaning

Postbraze cleaning is primarily done to remove flux residues, which may cause corrosion of the metal and weaken the structure if they are not removed. A thorough cleaning of the assembly after brazing is provided by the following method:

(*a*) Allow the brazed parts to cool slowly to room temperature in order to avoid sudden cooling, which may lead to distortion and possibly cracking. Then dip them in boiling water.

(*b*) Dip the parts in a cleaning solution held at a temperature of about 150 F. Several solutions may be selected: (1) a 10% solution of sulphuric acid for about 30 minutes, (2) a 5% sulphuric acid solution for about 5 to 10 minutes or (3) a 10 to 50% nitric acid solution

for a period of 10 to 20 minutes.

(c) Rinse the parts in clean water at approximately 150 F. In some cases, it may be necessary to begin the cleaning by scraping off stubborn deposits of flux residues. With assemblies involving exceptionally thin sections, it may be necessary to use more dilute solutions or shorter periods of immersion than are given above.

Production Torch Brazing

No specific recommendations for production set-ups can be given since the arrangement in each plant must be planned to fit the particular product. The following general suggestions may prove helpful:

Design the various components of the assembly so that they are self-jigging or otherwise easy to position.

Use properly designed jigs, fixtures and positioners.

Wherever practicable, make use of preplaced washers, rings, discs or other forms of filler metal.

Use multiflame tips and multiple-torch combinations so as to speed up and control the heating.

Use endless-chain arrangements or other suitable conveyors to time the passage of the parts through the brazing flames and to eliminate unnecessary handling in the movement from one assembly position to the next.

Divide the various steps of cleaning, fluxing, flowing the filler metal, etc., among several workmen so that each operation will be in the hands of a specialist.

The virtues of aluminum are too well known to warrant repetition. Almost everyone likes the metal, though its relatively higher cost (calculated on a price per pound basis) has often prevented its more widespread use. However, its light weight (approximately one third that of steel), its generally excellent corrosion resistance and other useful properties often mean lower intrinsic cost. This and recent developments within the aluminum industry which are likely to increase possibilities of the metal competing more favorably on a strictly pound-price basis indicate that the future will see a greatly increased use of aluminum in a wide range of applications.

Torch Brazing Possibilities

Even if a wider use of aluminum does not materialize, the possibilities of torch brazing as a method of joining the light metal appear almost without limit. The following examples were selected at random from a long list of items reported or suggested in current literature as practicable and economical:

Kitchen utensils: percolater parts, spouts and handles on pots, pans, tea-kettles.

Refrigeration and air-conditioning equipment: condensers, heat exchangers, intercoolers, ice-cube trays and fans.

Furniture: tables, chairs, sofas, cabinets, picture frames and miscellaneous household appliances and furnishings.

Lighting equipment: fixtures, reflectors, lamp shades and fittings.

Builders' hardware: windows, doors, casings and miscellaneous construction items.

Electronic and electrical equipment: radio racks, chassis, panels, shields and meter casings.

A variety of aircraft, automotive and railroad parts and accessories.

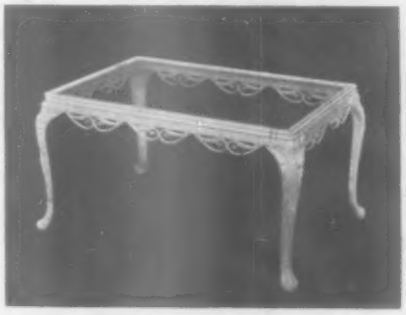
Bicycles, outboard motors, rowboat oars, toys, cigarette lighters and various gadgets.

Office equipment: adding machine and typewriter parts.

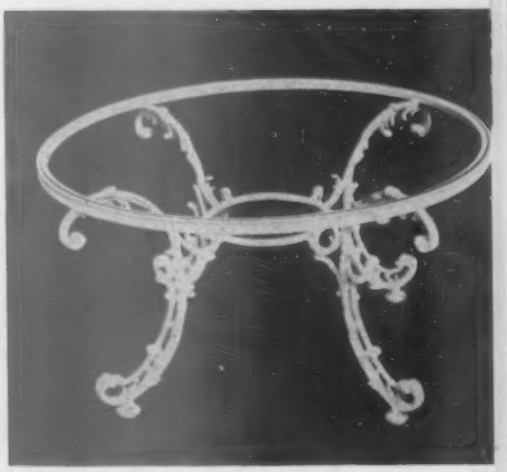
Chemical equipment: tanks, vats, linings, etc.

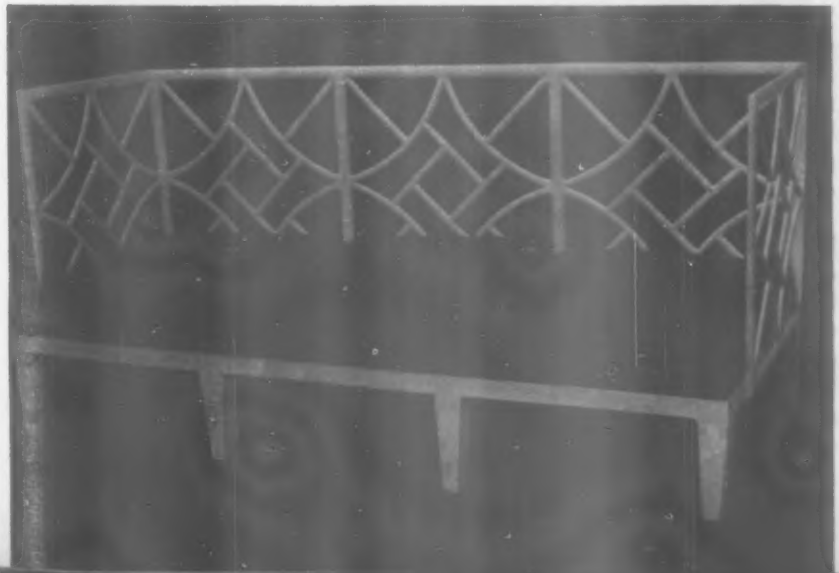
Boxes, trunks and containers of all kinds.

If the present interest now being shown in aluminum continues, it appears highly probable that additional alloys of "brazeable" aluminum and additional filler metals suitable for brazing existing types of aluminum will be developed. This, of course, would enlarge the possibilities still further.



Two types of Elliott coffee tables fabricated by the torch-brazing technique. This manufacturer specializes in aluminum furniture that follows the patterns of classical cabinet-makers





Another product of Elliott Mfg. Co. is the torch-brazed settee on the left. This is of Chinese Chippendale design

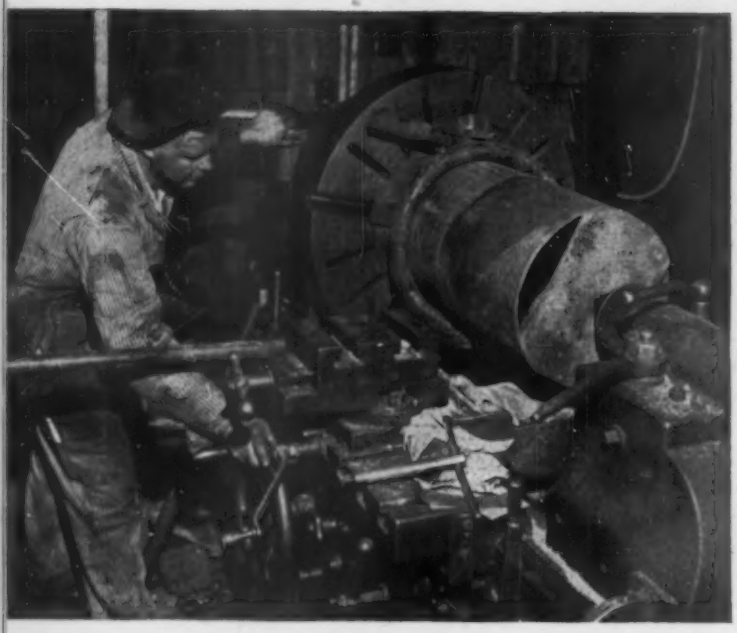


Fig. 1—This machine is starting the bending of a 20-in.-diameter heat exchanger coil of the helical type

Fig. 2—Careful check of each coil for dimensional accuracy is made by an inspector. These are the coils that are turned out on the machine shown in Fig. 1

★CONSTRUCTION

Bending and Welding

Olympic Pipe Fabricating Co., Seattle, makes a specialty of prefabricated marine piping installations. The pipe is bent cold before welding, bending being done on three specially made machines of the company's own design.

BY M. G. HAWKINS

PREFABRICATED pipe installations produced by cold bending and welding are the specialty of the Olympic Pipe Fabricating Co., Seattle, Wash. Such pipe is made mainly for marine installations and is used for such purposes as refrigerating fish, heating, conveying water, disposing of sewage, electrical conduits and even for the fog horns of ocean-going fishing vessels.

Used in the form of refrigeration coils, prefabricated pipe is the heart of the vast fishing industry of the Pacific Northwest, for it guarantees the preservation of fish caught anywhere in the Pacific from Alaska to South America until the canning stations can be reached.

Cold bending of pipe to fit the contours of tuna fish clippers was one of the special problems encountered and solved by Olympic Pipe Fabricating. Having a working range of 6,000 miles, these luxury fishing vessels are provided with large refrigerated areas to "quick freeze" fish as they are caught and keep them solidly frozen. The four newest clippers are being equipped with 35,000 cu ft of refrigerated space each on one pair and 70,000 cu ft each on the other.

This refrigeration is accomplished by means of thousands of feet of coils carrying ammonia to provide heat absorption. The heat that the ammonia absorbs is then dissipated by means of condensers located in tanks circulating ocean water.

The first step in building one of these mammoth ocean refrigerators is a very careful consideration of the bends that are necessary to fit the ship's contours. After the engineers have mapped out the entire design of the space to be refrigerated, their plans are given to the shop superintendent, who assigns the work to the various machines.

Three very efficient bending machines have been designed by Olympic and are specially made to carry out this sort of work. One of them is shown in Fig. 1 as it starts the fabrication of a 20-in.-diam heat exchanger coil of the helical type. How this spiral coil looks when completed may be seen in Fig. 2.

An entirely different type of coil

Fig. 3—This type of bender is used to make 180-deg return bends. It consists of a rotating die of the desired radius and an idler wheel held against the bend

Fig. 4—The bent pipes are placed in this wooden pattern rack for welding. The rack is of the same contour as the shipboard space the finished coil will occupy

Pipe Coils

is used for the refrigeration piping. Its manufacture begins with the cutting of the 1¼-in. pipe into the proper lengths. Allowance is made for the 180-deg return bends and also for contour bends when these are necessary.

General pipe bending practice limits the radius of the bend to five pipe diameters, but in refrigerator coils it is allowable to go as low as 1.75 diameters without using any filling medium.

The cut length of pipe is forced through a horizontal cold bender (Fig. 3), which has a rotating die of the same radius as the desired bend. The pipe is held in place between the rotating die and the grooved shoe of an idler wheel. The idler is adjusted by a hand crank to keep proper pressure against the point of bend. The die rotates counterclockwise while the idler presses against the outer edge of the pipe. The machine is stopped manually when the proper angle of bend has been reached.

Every precaution is taken to avoid rupture or bursting as the pipe is subjected to the stress of bending. The pipe is also closely watched to insure uniform bending, and each bend is carefully checked to make sure of its dimensional accuracy.

Jigging for Welding

The required number of 180-deg return bends necessary for a particular coil are placed in the grooves of a wooden pattern rack (Fig. 4) that conforms to the space where the coil will be located aboard ship. Using a welding torch and filler rods, each bend is welded to the open end of the next until the correct number of bends for the coil has been welded. The end pipes are left open for union with other coils when the installation is made on board the clipper.

The prefabricated coils, now called panels, are hand trucked to the stacking grounds (Fig. 5) to await galvanizing.

In addition to its extensive marine piping systems, Olympic Pipe Fabricating also manufactures radiant-heating coils, pipeline conveyors for concrete plants, pipe guards for protection against geared machines and twin-post truck lifts for a trucking concern. Besides the three specially made pipe benders, its equipment includes a 10-ton bridge crane, gas and arc welding equipment, three engine lathes, a horizontal mill, three drill presses and a complete assortment of dies for pipe bending.

Fig. 5—The welded coils (panels) are stacked to await galvanizing

★ RESEARCH

New Design for A-C Welders

BY ARTHUR SIMON

A Swiss inventor has patented a novel a-c welding transformer with many advantages. One of these is that the arc is reestablished promptly at points of zero current.

IN THE early days of arc welding, a steady arc could be maintained only through the use of direct current supplied by a motor-generator. The early welding motor-generator was expensive in both first cost and in operation and had a low efficiency, especially at low load. Hence, many attempts have been made to develop a-c welding apparatus. Success in developing a welding transformer was followed by the equally necessary development of special a-c electrodes.

An alternating current passes through zero at each half cycle. This means that an a-c welding apparatus should supply a relatively high open-circuit voltage to facilitate the restriking of the arc after the point of zero current has passed. To maintain a stable arc, however, the effective arc voltage should decrease after the current flow is reestablished and as the effective current continues to increase. The apparatus should also permit the normal welding current to be adjusted within a wide range to take care of different welding operations.

The first of these requirements necessitates an arrangement which automatically varies the ratio between the primary and the secondary voltages; the second requires a manual adjustment of the effective ratio between the primary and secondary voltage. To obtain the latter, the secondary winding may be provided with a number of selective taps, as is shown schematically in Fig. 1. The number of adjustments is, of course, limited and in discrete steps; the construction is somewhat complicated and the ratio can only be changed during idling periods.

Another system (Fig. 2) employs an auxiliary reactor with a

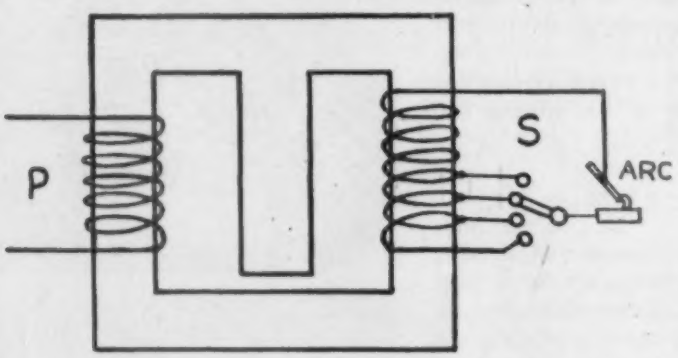


Fig. 1 (left)—Adjustment of welding current may be effected manually by means of selective taps. Change, however, is possible only in discrete steps

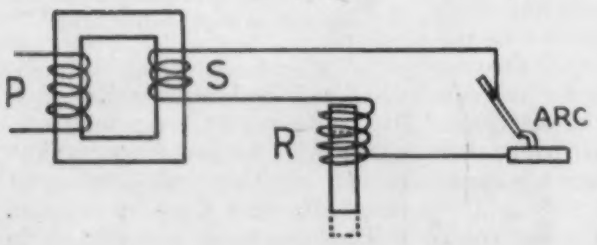
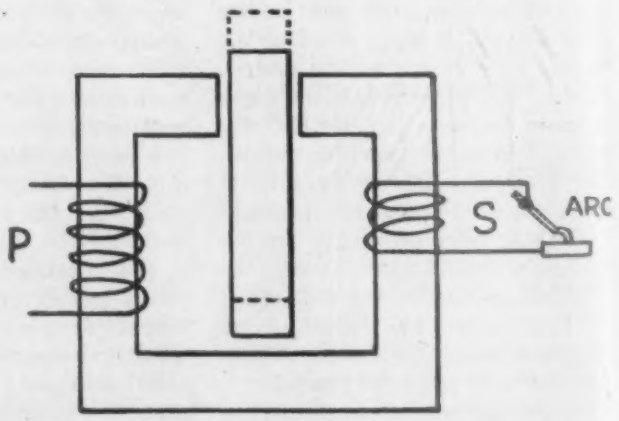


Fig. 2 (above)—Another method of current selection is to connect a reactor having a movable core in series with the welding transformer secondary winding. This gives continuous current adjustment

Fig. 3 (below)—The movable magnetic shunt is a modification of Fig. 2. Only an adjustable portion of the primary magnetic flux is allowed to induce a current in the secondary winding



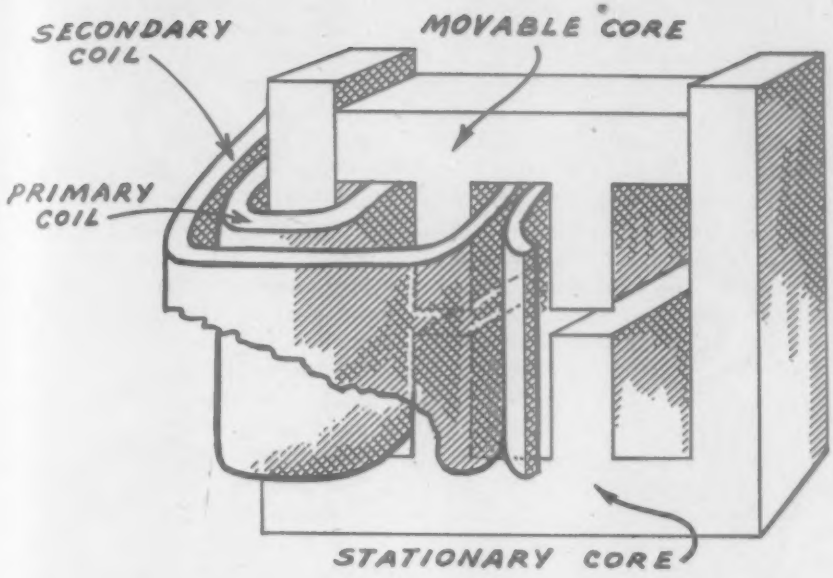


Fig. 4—Perspective sketch of new-type a-c welding transformer. There are actually two primary and two secondary coils, but the second pair has been omitted to show details of the core portion. The movable core slides up and down between the ends of the U-shaped stationary core to vary the reluctance of the magnetic shunt and hence the impedance of the secondary coil

movable magnetic core that is connected in series with the welding transformer secondary winding. Probably a more satisfactory arrangement is to provide a shunt magnetic circuit (Fig. 3). This circuit is so designed that an adjustable portion of the flux induced in the primary coil can be shunted around the outside of the secondary coil. Hence only an adjustable portion of the primary flux induces a current in the secondary coil.

Divided Secondary Coil

Yet another possibility is to divide the secondary coil into two series-connected sections. One section is wound concentrically with the primary coil, while the other section is wound on a separate magnetic circuit in shunt with the main magnetic circuit. The voltage of the second section or regulating coil is opposed to the voltage induced in the first section. By adjusting the reluctance of the shunt, the voltage of the regulating coil is varied and hence the net voltage supplied to the arc may be varied.

A Swiss inventor, Eduard Fries, has patented a welding transformer of this type. Instead of providing a separate regulating coil in series with the main secondary coil, however, the functions of the two are combined in one coil. This is done by arranging the magnetic circuit so that the secondary winding encloses both the core of the primary winding and the secondary magnetic shunt. Furthermore, the primary winding is arranged inside of the secondary winding. The compact arrangement that results may be seen by Fig. 4, a perspective sketch of the transformer with part of the winding broken away.

The primary and the secondary windings are each divided into two coils, which may be connected either in series or in parallel, depending upon the primary and secondary voltages. In the primary magnetic circuit there is a stationary U-shaped laminated core which has two inwardly projecting secondary cores or poles on its central leg. The primary magnetic circuit is completed by a movable core—a horizontal member which slides up and down between the ends of the U. The two primary coils are wound on the two legs of the primary core. The movable core is provided with two projecting cores which register axially with the secondary poles of the stationary core in order to provide a variable air gap between each pair of projections. The secondary coils are wound over the primary coils; in addition to the corresponding primary coil and core, each secondary coil also encloses the pair of adjacent projections.

Movement of the movable core does not materially change the reluctance of the primary magnetic circuit, but it does vary the reluctance of the magnetic shunt between wide limits and thus varies the impedance of the secondary coil to give a stepless amperage control.

Fig. 5 shows the appearance of the transformer assembly and its

Fig. 5—The transformer assembly with case removed. The bracket, "B," is mounted on the U-shaped stationary core to provide a bearing for the adjusting screw, "S," connected with the movable core

Fig. 6—The welder as installed on its carriage. The handwheel on the top of the case turns the adjusting screw shown in Fig. 5

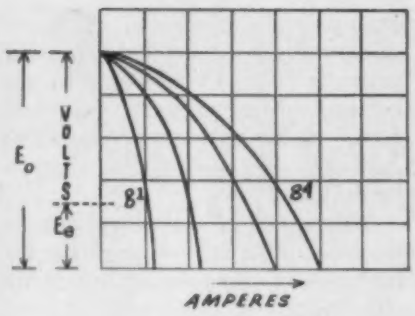


Fig. 7—Voltage and current relation for different-size air gaps (g_1 very small gap; g_4 very large gap). The open-circuit voltage E_0 is practically constant for all current settings or air-gap openings, no matter how the arc voltage E_a may be varied for welding

adjusting mechanism when the enclosing case has been removed. In this photograph, "B" indicates a bracket that is mounted rigidly on the U-shaped stationary core. Through the center of this bracket passes an adjusting screw, "S," connected with the movable core. When this screw is turned by a handwheel on the outside of the case (Fig. 6), the movable core moves up or down relative to the stationary core. The core is the only movable part of the welder, and it has to travel only a short distance to give any desired amperage setting. The adjustment of the transformer throughout its current range requires only a few turns of the handwheel and can be made while the operator is welding.

Constant Open-Circuit Voltage

From Fig. 4 it may be seen that when the secondary circuit is open —that is before an arc is established—the current in the primary winding produces a flux which passes through the stationary primary and movable core. The magnetic circuit being completely closed, very little of this flux leaks through the shunt magnetic path. The result is that the open-circuit voltage induced in the secondary winding is constant for all adjustments of the air gap in the magnetic shunt path (see Fig. 7). This is quite different from the conventional welder. If the latter is adjusted for low currents, the open-circuit voltage is also low, thus making it more difficult for the current to restrike at each passage of the alternating voltage through zero.

In the new-type welder, the secondary open-circuit voltage leads the secondary current, as is shown by the curves of Fig. 8, which are drawn from an oscillogram. The phase difference is such that the voltage at current zero is about equal to the arc voltage. The arc, therefore, is reestablished promptly after passage through current zero. The result is a substantially square current wave. The current flows during practically all of each half cycle, affording a maximum amount of energy supply to the arc. The steady arc permits the use of carbon electrodes for brazing and welding.

Since the secondary reluctance varies directly with the secondary current, any decrease of arc current due to increase of arc resistance raises the arc voltage. This, too, makes for a steady arc.

The magnetizing loss at any load is very low because the arrangement of the magnetic and electric circuits requires a minimum amount of active material. The only magnetic material, in addition to that required for a constant potential transformer, is that of the stationary and movable secondary projections. For the same reason, the welder has also relatively low iron losses, and these are substantially the same for all current settings. In other welding transformers the iron losses due to the stray magnetic flux are often a large part of the total magnetic flux.

On account of the low iron weight, the idling losses of the transformer are very low, and it yields a high overall efficiency.

The amount of copper in the transformer and copper losses are also a minimum because the secondary coils have the additional function of the reactor coils. The diameter of the secondary coils is only slightly more than it would be if they were wound directly over the primary coils without encircling the shunt cores.

The entire magnetic structure of the transformer is solidly bolted. The coils are wound with glass-insulated wire and are rigidly mounted on the frame. The enclosing case is designed to permit fresh air to enter at the bottom, and pass over all heat-generating parts of the machine before it leaves through grills at the top.

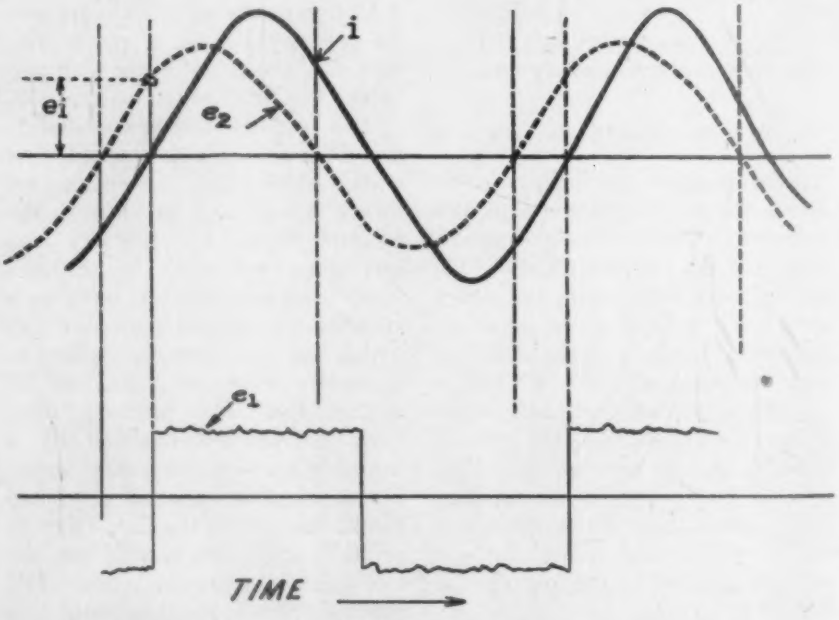


Fig. 8—Current and voltage waves as taken from an oscillogram. The phase difference between the secondary open-circuit voltage, e_2, and the welding current, i, is such that the voltage e_i at the points of zero current is substantially equal to the arc voltage, e_1. A steady arc is the result

"Half-inch or Thirty!"

You don't do much shopping around for the fittings you need when you deal with the Tube Turns distributor. He's got 'em or can get 'em for you, fast—welding elbows ranging in diameter from tiny half-inch to a mighty thirty inches, welding fittings of all types and thicknesses in a wide range of sizes.

Tube Turns' complete line of TUBE-TURN welding fittings and flanges in grade A and grade B carbon steels contains more regularly manufactured items than any other line—more than 4,000! And this is supplemented by an extensive selection of items in a wide range of special metals and alloys —stainless steels, carbon moly steels, chrome moly steels, copper, aluminum, brass, monel metal, inconel, nickel; wrought iron.

Write for the name of your nearest Tube Turns distributor, and for facts about how the fittings that become part of the pipe serve others in your industry.

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TUBE-TURN *Welding Fittings and Flanges*

ONE SOURCE OF SUPPLY FOR ALL WELDING FITTING REQUIREMENTS

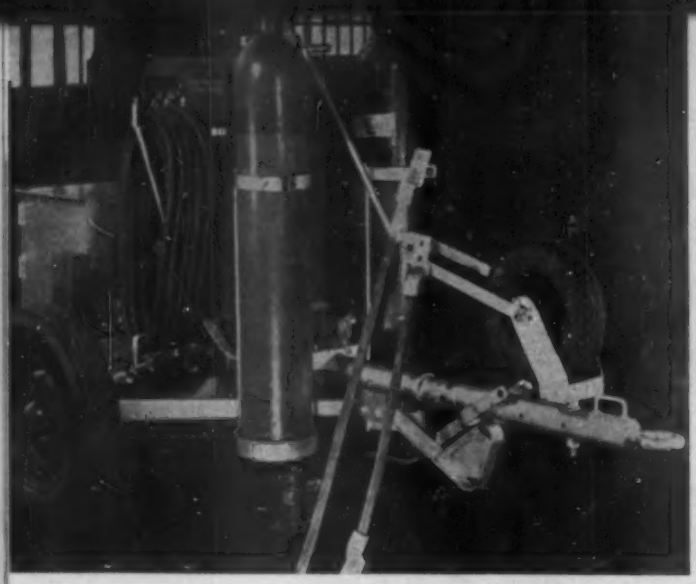

Fig. 1—With the third wheel up and cables looped on their racks, the trailer is ready to be hooked to a truck for transportation between plant sites. Note the two welded aluminum conductors leaning against the tongue

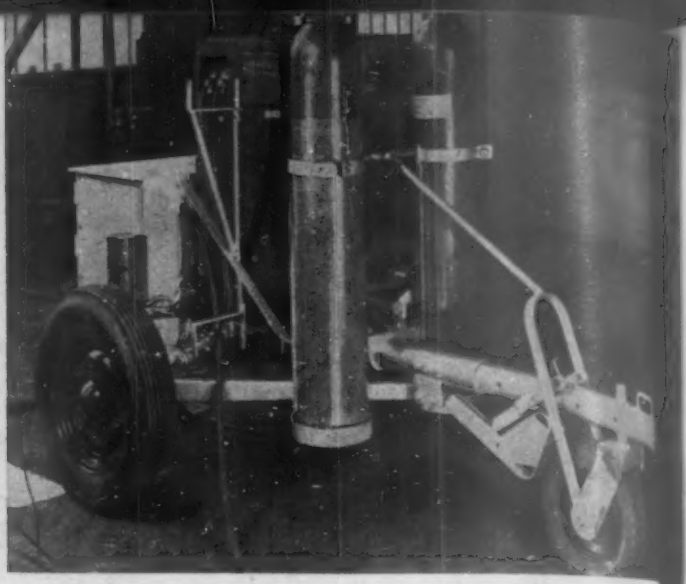

Fig. 2—This side view shows the inert-gas-shielded arc welding trailer in position to weld. Power cable appears in the foreground and water connections in the background. The third wheel is in place under the tongue

★ RESEARCH

Portable Trailer for Inert-Gas-Shielded Arc Welding

INERT-GAS-SHIELDED arc welding has taken to wheels! The portable welding trailer shown in Figs. 1 and 2 was built by engineers of the Aluminum Company of America's welding section for the specific purpose of welding together aluminum electrical conductors during the construction of new plants. Although not intended for outdoor service, the welding equipment has been mounted on a three-wheel trailer to facilitate transport.

With its third wheel retracted and cables looped on their racks (Fig. 1), the trailer is ready to be hooked to a truck for hauling between plant sites. When the small wheel has been lowered under the trailer's tongue (Fig. 2), the equipment can be towed by hand or by plant power trucks.

Leaning against the tongue of the trailer in Fig. 1 are two of the 1,300-mcm aluminum cables welded by this process. The inert-gas process was selected to do this work because it requires no flux when an argon shield is employed in conjunction with an a-c welder.

The trailer carries a 20-kva welding transformer, a special electrode holder or arc torch, two cylinders of argon, connections for the water and drain lines and about 75 ft of cable and hose—25-ft leads with a 50-ft extension to permit welding to be done near the ceiling or in other ordinarily inaccessible locations. To operate, the only requirements are a 60-cycle power source of 440 or 220 volts and a supply of clear, cold water, flowing at a rate of ½ gpm and a pressure of 50 psi, to cool the electrode holder and its power cable. Electrical controls protect the torch against failure of the water supply and also start and stop the flow of argon gas.

Welding with Argon

As shown in Fig. 3, the arc is drawn between a single tungsten electrode and the work. Both the electrode and weld-pool of molten aluminum are protected from oxidation by an envelope of argon gas. Argon is not only inert but is practically insoluble in aluminum so that there can be no weld porosity. The high-heat intensity of the tungsten arc permits the joints to be made quickly with minimum heating.

The Aluminum Company of America's portable welding trailer can very easily be applied to other work than aluminum conductors. It gives smooth, strong joints in aluminum tubing, extrusions and sheets of up to ¼-in. thickness.

Fig. 3—Welding the bung of an aluminum beer barrel by the inert-gas method. A single tungsten electrode is used with a filler rod

FACTS WORTH NOTING

RUFLUX S

WELDING ROD COATING

Known for its arc stabilizing properties—RUFLUX S is a sodium titanate containing approximately 80% T_1O_2 and 15% Na_2O. Specific gravity 3.93, mesh size-plus 200, and weight per cubic foot 48 lbs.

Included in welding rod formulation—it aids in speeding welding operations and helps assure proper slag formation.

TAM

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Executive Offices: 111 Broadway, New York City *General Offices and Works:* Niagara Falls, N. Y.

Western Metal Show

Courtesy Air Reduction Co.

Electronically controlled flame-cutting drew a large crowd of interested spectators—one of the 188 exhibits at the Western Metal Exposition

Those who went to California for the fifth Western Metal Congress found a big change in coast metal fabricators

BY T. B. JEFFERSON

HELD for the first time in six years, the fifth Western Metal Exposition and Congress opened in the Oakland, Calif., auditorium on March 22 with 188 manufacturers displaying their wares to a public eager to see the newest developments in machines and tools for forming, shaping and fabricating metals. The extent of the interest west of the Rockies in metal-working equipment was well indicated by the attendance. Some 80,000 persons viewed the exhibits during the six days the exposition was open.

Simultaneously with the Western Metal Congress, the American Society for Metals, American Welding Society and the American Foundrymen's Association staged technical sessions. There were also a number of west coast associations and societies coöperating. The American Welding Society sponsored four days of technical activity, which began Monday, March 24, and continued to Thursday noon. In six technical sessions, 14 speakers presented papers covering subjects as widely diversified as hard-facing, welding of stainless and heat-resisting alloys, oxy-acetylene pressure welding, resistance welding and resistance-welding applications, electronic controls, inert-gas-shielded arc welding, welding of high-temperature alloys, thermit welding of rails and large castings, modernized fabrication, a-c welder developments, structural welding and low-temperature brazing.

A noon luncheon was held Monday at Zericotes Lake Merritt dining room. Not only was this the official convention luncheon of the American Welding Society, but it also commemorated the twenty-fifth anniversary of the AWS San Francisco Section. C. S. Smith, of Linde Air Products Co., served as master of ceremonies and introduced the other speakers, among whom were Carl J. Eastman, president, San Francisco Chamber of Commerce, and James H. L'Hommedieu, president of the Oakland Chamber of Commerce.

Lee Delhi, national president of the American Welding Society and a Californian, spoke on the future possibilities of welding in the west. Following this address, he presented the Lincoln Gold Medal Award to H. E. Kennedy, Albany, Calif. Mr. Kennedy, a co-inventor of the submerged-melt welding process, was given this award for his paper, "Some Causes of Brittle Failure in Welded Mild-Steel Structures." He is a research assistant in engineering at the University of California, and his varied interests have extended from welding into the fields of thermal control, X-rays, electric furnaces and Diesel engines.

The social activities of the Western Metal Congress were confined to a dinner-dance entertainment at the Palace Hotel, San Francisco, on Thursday evening. Some 400 attended this affair. Preceding the banquet, an AWS cocktail hour was held, also at the Palace Hotel.

It was a profitable week for everyone who attended. The people on the west coast were afforded an opportunity of learning more of what is happening in the metal-working field nationally, while eastern exhibitors and guests obtained a much better idea of the aims of the westerner in the metal industry. Both East and West are looking forward to the next meeting of this type, which will probably be held some time in 1949.

H. E. Kennedy (right), Albany, Calif., co-inventor of submerged-melt welding, accepts the Lincoln Gold Medal Award from Lee Delhi, AWS president and vice-president of the California Steel Products Co., Richmond, Calif., who served in behalf of The Lincoln Electric Co. at the official convention luncheon

McGraw-Hill Pacific Coast News Bureau

Looking for Us, Chief?

Reproduced from an Old Engraving in Sears Pictorial Description of the United States Published 1848

1847 1947
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to Industry
THAT MADE
America Great

WE WERE HERE WHEN MILWAUKEE WAS SPELLED M-I-L-W-A-U-K-I-E!

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One-hundred years later, in 1947, this progressive city salutes its oldest heavy machinery manufacturer—Allis-Chalmers . . . *one of the Big 3 in electric power equipment—biggest of all in range of industrial products!* Today, practically every U. S. manufactured product is aided in its course by Allis-Chalmers equipment.

In building a *better* millstone, crusher, turbine, motor—Allis-Chalmers has earned the respect and confidence of men in every industry.

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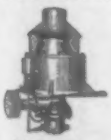

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Pulp, Paper, Saw-Mill Equipment

Food, Milling & Extraction Equipment

Chemical & Pyro-Process Equipment

Marine & Defense Equipment

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A 2192

On the Job

Fabricated Pump Casing

ONE of the largest fabricated casings that was ever constructed for a dredge pump was recently completed at the San Francisco yard of the Bethlehem Steel Company's shipbuilding division. The new pump, weighing 42,000 lb, was designed by the Hydraulic Dredging Co., Ltd., Oakland, for the suction dredge, *Papoose*.

Previous practice has been to use a heavy cast-steel pump casing, perhaps as thick as 6 in., which acts as a strength member. To keep the casing from taking the abrasive wear from the dredged material, plate liners are fitted to it. This requires a square corner on the pump casing which, while not impossible in a cast design, is more easily accomplished with a casing fabricated from steel plate. The saving in weight of the fabricated casing is a further advantage to the dredge operator.

The fabricated pump casing is of the overshot type and is laid out as a modified spiral with a maximum inside diameter, excluding liners, of 8 ft 9 in. The back of the pump is of 1 ¾-in. mild-steel plate with radial stiffeners 6 by 1 ¾ in.; the wrapper plate is 41 by 2 in. The so-called "front door" of the pump is of the drum-head type and constructed of the same dimensions as the back; when removed, it clears the entire interior of the casing for liner maintenance. The liners on the door and back of the pump casing are double: a ¾-in. mild-steel backing piece and a 1¼-in. high-carbon (0.60% C) steel wearing member. The circle liner on the wrapper plate is a single 1¼-in. high-carbon steel plate arranged in six easily handled sections.

Skill was required in maintaining the alignment of these heavy members because the tolerance for welding distortion was limited in an effort to do away with expensive machining operations. The entire procedure was aimed at producing a machined finish by welding preshaped parts, and the Bethlehem fabricating experts successfully accomplished this objective. The entire casting was stress relieved in a furnace after fabrication.

This is not the first major job Bethlehem has performed on the *Papoose*. When the dredge was taken over by the Navy, the San Francisco yard increased the length of its digging ladder to enable it to dredge at the unusual depth of 100 feet. This was done by cutting the ladder apart and inserting a 50-ft section.

* *

Positioning Dump Trailers

EUCLID ROAD MACHINERY CO., Cleveland, is using arc welding to fabricate such heavy road-building machinery as bottom-dump trailers and coal haulers. The accompanying picture shows a 13-yd, 20-ton bottom-dump trailer being welded in a motor-driven positioner. Use of positioners permits 95% of the welding to be done in the downhand position.

Welded construction, say Euclid engineers, simplifies design and lowers manufacturing costs without sacrifice of quality.

Courtesy General Electric. Co.

This 13-yd dump trailer is being turned in a positioner to allow all downhand welding

* *

Welded Plane Mufflers

A LIGHTWEIGHT muffler for 65-85 hp light aircraft engines is being fabricated from stainless steel on a production basis by the Ryan Aeronautical Co., San Diego, Calif. Three different welding processes are employed.

Ryan stainless-steel muffler for light aircraft. It is fabricated by three different welding processes—arc, gas and resistance

The two halves of each unit are stamped out of sheet metal with a drop hammer, using a punch and die. Each of these stampings includes a flange that extends around the periphery of the muffler but not down the length of the legs for the engine ports. The half stampings are joined together by seam welding the flanges—a fast, clean method of production. The port legs are added by oxy-acetylene welding, and the engine port flanges (not shown in illustration) are arc welded. These flanges are blanked out of plate stock and are welded on the muffler legs by means of the metal arc. The metal-arc method is the preferred choice for the rapid welding of all attachment fittings and other appurtenances.

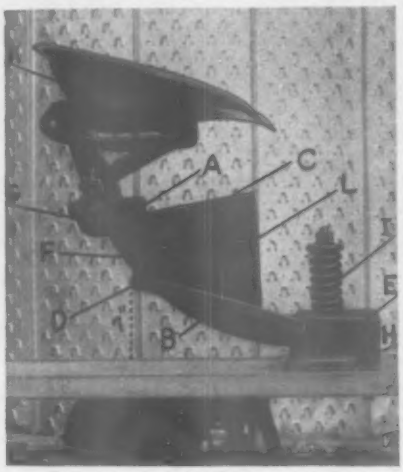
The new Ryan muffler works on the basic principle of slowing the velocity of hot escaping gases by channeling them into an expansion chamber before their release into the open air. It incorporates four functions in its design: (1) an exhaust system, (2) a muffler which eliminates 90% of the engine noise, (3) provision for heating the carburetor air and (4) provision for delivering heat to the cabin for passenger comfort.

Hydraulic Tractor Seat

By Delmar Walton

I MOUNTED an automobile shock absorber on the seat of my "Farmall" Model H tractor, and I now have one of the most comfortable hydraulic tractor seats that I have ever ridden on. The shock absorber I bought from an auto graveyard for only $1. The only other materials needed were two pieces of scrap steel: one 15 by ⅜ in. and the other 6 by 1¼ by ⅜ in. The total time it took to complete the assembly was less than 1½ hours.

To facilitate the installation, I first removed the seat from the tractor and bolted the seat base to a good-size board. I welded the 6-in. length of steel to the seat post as shown by (A) in the accompanying picture. The shock absorber was bolted to this piece. The 15-in. length of steel (B) was welded to



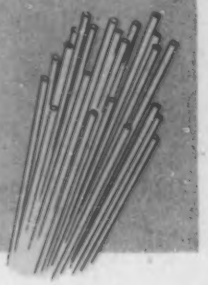
Courtesy The Hobart Brothers Co.

This is the hydraulic tractor seat designed and built by Mr. Walton. Explanation of letters is given in text

the seat base (E). I next cut a ball from an old shock absorber hanger and welded it to the bar (B) as shown at (D) to permit the regular connecting link (F) to be used. The bar (B) had to be bent slightly so the ball (D) would be in line with the ball (C) on the shock absorber arm. Also the ball (D) had to extend back of ball (C) about 1¾ in. when the seat was in the highest position. Since the seat pivots at (H), this allows the shock absorber connecting link to work almost vertically, which is its best position. The ball (D) should be about 7 in. above the level of the seat base when the seat is in its highest position so that the shock absorber arm (G) can work within its range. The unit can be mounted on either the right or left hand side of the seat, depending upon use of left or right handshock unit.

The seat (K) can be turned over to keep the top dry in case of rain, and the pitch of the seat can also be adjusted as can the tension of spring (I). Installation of the hydraulic seat does not interfere with the tool box (L) on my particular farm tractor.

these 3 men prefer TITAN BRONZE WELDING RODS



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- Have low melting points.
- Are very low fuming.
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- Pre-cleaning can be eliminated with certain types of rods.

THE INSPECTOR

Because welds made from TITAN Bronze Welding Rods:
- Are always sound and free of porosity.
- Possess high strength and excellent ductility.
- Have unsurpassed bonding properties on a wide range of materials.

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Because Titan Metal Mfg. Company:
- Provides a type of bronze welding rod to meet every requirement.
- Maintains high standards of uniformity and quality, eliminating complaints from the shop.
- Handles all orders promptly, efficiently, and courteously.

All TITAN Bronze Welding Rods are doubly deoxidized by a patented process which protects against formation of gases and harmful oxides when welding. For complete satisfaction, specify TITAN when next you order welding rods. Literature on request.

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★ RESEARCH

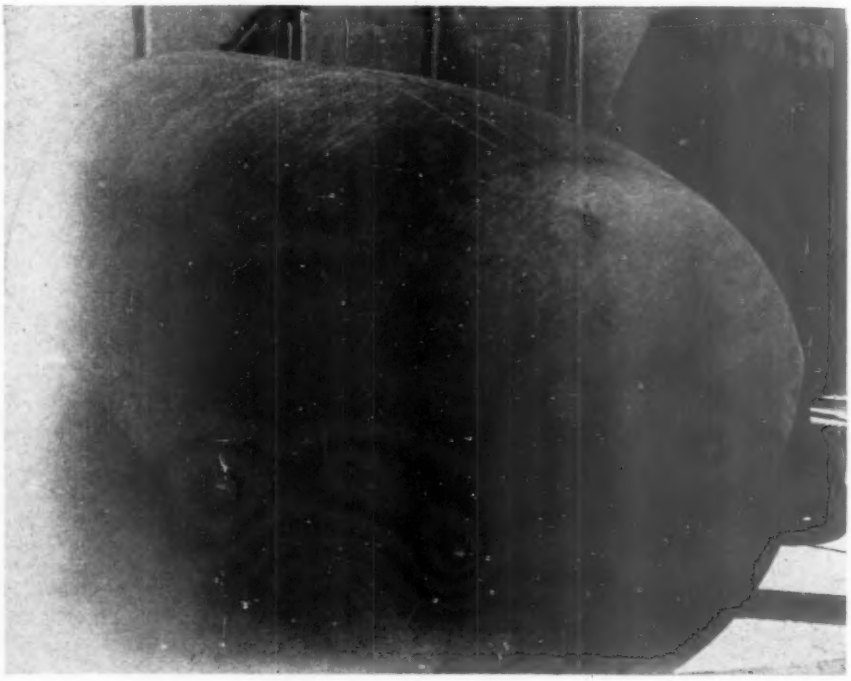
Welded Tank Fails at 960 Psi

Engineers deliberately destroyed an all-welded gas tank in order to see if theoretical calculations would check with the actual results. What they learned is told here.

ENGINEERS at the Dallas Tank Co., Dallas, Texas, recently conducted the interesting technical experiment of testing to destruction a tank of their own design and fabrication. The tank (Fig. 1) was a cylindrical underground butane gas tank. The shell was fabricated of a rejected laminated A-70 flange, $\frac{3}{16}$-in. sheet, and the heads were of ASME standard design, referred to as the "high crown" type by this manufacturer.

In fabricating the tank, the shell was rolled to a 24-in. OD and was manually welded inside. Flanged dished heads, backed up by steel bars, were positioned and tack welded, and a 2½ in. steel coupling (Fig. 2) was fillet welded to the shell in a single pass. From this point on, automatic welding was employed for the longitudinal and head seams.

The first step in the experiment was to evict all free air from the tank and pipe. This was accomplished by pumping in water. The water pressure was then gradually stepped up to meet the requirements of the experiment.



Photos courtesy The Lincoln Electric Co.

Fig. 1—Tested to destruction, this tank began to deform at 700 psi, and a fatigue crack opened on the top of the shell at 960 psi. Note that the welded seams remained intact. Testing was discontinued at 970 psi

At a pressure of 700 psi, the tank inspector observed deformation beginning to occur. He carefully measured the circumference and calculated the outside diameter. At the end of the experiment the outside diameter had expanded from 24 in. to $27\frac{27}{32}$ in.—$3\frac{21}{32}$ in. over the original diameter. It was observed that surface laminations appeared on the area where the greatest expansion of the diameter had occurred.

At a pressure of 960 psi, a fatigue crack opened on the top of the shell, and the tank began to leak. The leakage increased until 970 psi pressure had been reached. The experiment had to be concluded at this point because the pump was unable to develop any greater pressure.

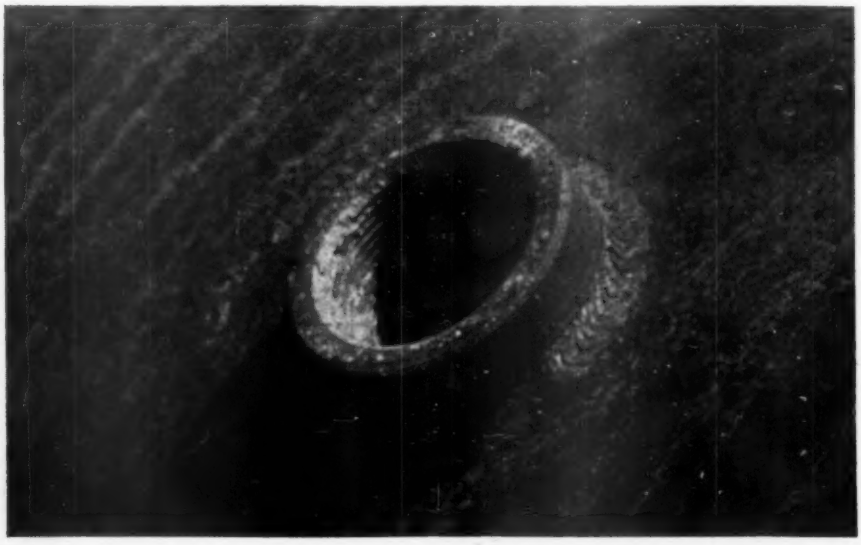
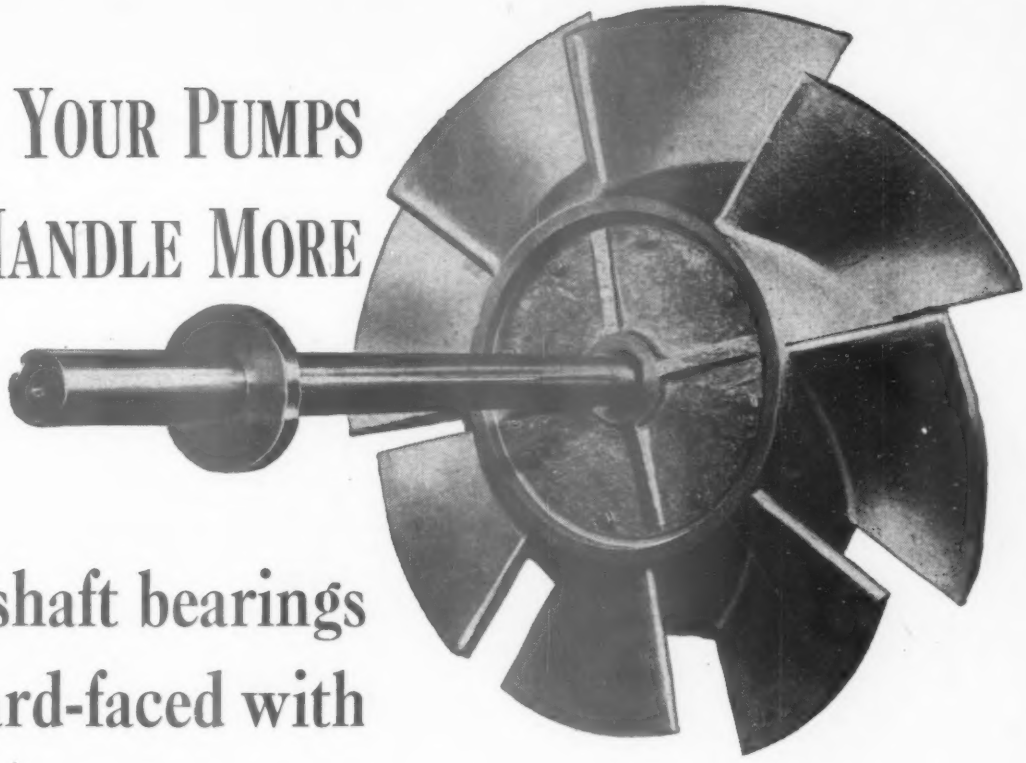


Fig. 2—This is the 2½-in. steel coupling that was fillet welded to the shell in a single pass

YOUR PUMPS CAN HANDLE MORE



when shaft bearings are hard-faced with HAYNES STELLITE Alloy

The bearing surfaces on the shaft of this caustic soda pump were hard-faced with HAYNES STELLITE alloy No. 6. It is run at 900 r.p.m., to handle 135,000 gallons per hour . . . and it stays in service.

Protect the shaft bearings on your pumps with a welded-on layer of HAYNES hard-facing rods, and you can run them faster . . . thus increasing their hourly capacity. Because HAYNES alloys stay hard and wear-resistant—even at red heat—the hard-faced surfaces will stand up indefinitely, with no appreciable down time for replacement and repairs.

Metal surfaces that are in contact with the hard-faced deposit will resist wear for longer periods of time, too, because HAYNES STELLITE alloys take a high polish and have an extremely low coefficient of friction. This means less abrasion and less friction heat between the rubbing surfaces.

There is a HAYNES rod to meet almost any condition of wear, abrasion, heat, or corrosion. Write for the 104-page booklet "Hard-Facing With Haynes Stellite Products"—Form 2254—and see for yourself how these materials increase efficiency of your equipment, not only in pumps, but in any parts that require replacement because of wear. For engineering assistance, write or telephone our nearest district office.

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News of the Industry

No More Fumes at Erie Meter Co.

GREAT pride is taken by the Erie Meter Systems, Inc., Erie, Pa., in what is believed to be the most modern system of welding booths in the country (see picture). Each booth has an individual exhaust outlet into which all fumes and smoke are sucked up and expelled through a large overhead stack. The exhaust outlets are regulated to suit the convenience of each operator. Nor is this the only convenience: the overhead light in each booth is of sufficient candlepower to permit the operator to see the outlines of the workpiece even when his shield is down.

* *

B&W Will Fabricate Wood Pulp Digesters

FIVE welded rotary digesters for the manufacture of wood pulp, each weighing 77,000 lb, are to be built by the Babcock & Wilcox Co. at its Barberton, O., plant for the Camas (Ore.) mill of the Crown Zellerbach Corp., San Francisco. Two exclusive features will be used in the construction of these big vessels. One is the process by which the chromium-alloy lining is resistance-welded to the base metal; the other is the patented design for construction of the heavy center girth section to which the trunnions are attached by welding to permit the digesters to be rotated. With a full load, each digester will have a weight of 100 tons, entirely supported at two points.

Each of these units has an ID of 10 ft 3 in. and is 30 ft long over the end flanges. Each end is fitted with a cone, $1\frac{9}{16}$ in. thick. The shell is made of $1\frac{1}{8}$-in. steel plate with a heavy reinforced section, $3\frac{1}{4}$ in. thick, around the middle. The alloy liner is $\frac{7}{64}$ in. thick and will be applied over the entire surface; this alloy contains 13% chromium.

Between the steel and the alloy is a thin layer of nickel, which serves to prevent carbon migration from the steel to the chromium at fusion temperatures and helps to eliminate grain growth and embrittlement at the junction zone of the bond. The nickel also acts as a soft, ductile layer between the steel and chromium.

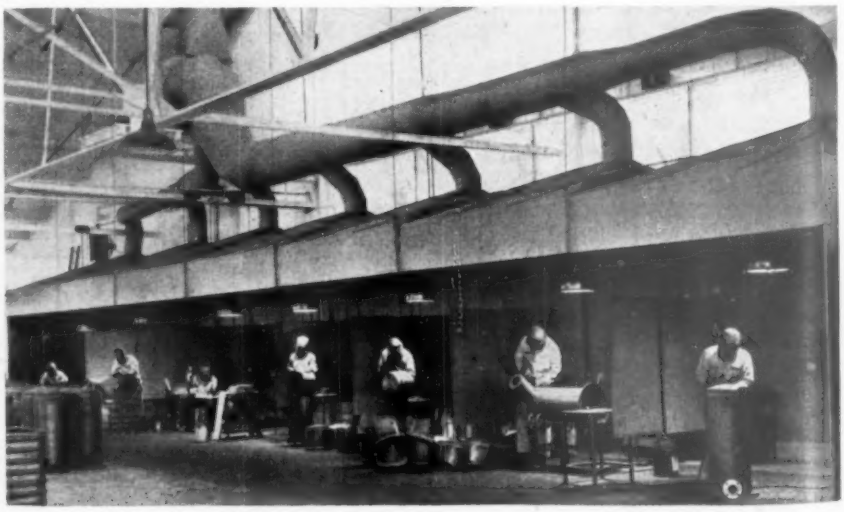
The lining is to be integrally bonded over the entire area by means of a large number of small, overlapping welds. Following the welding, the bonded plate will be heat-treated at approximately 1,600 F.

* *

ASME Semiannual Meeting in Chicago, June 15–19

PROBLEMS faced by engineers and scientists in the generation of usable power from nuclear energy and in various industrial uses of this power will be among practical considerations at the semiannual meeting of the American Society of Mechanical Engineers, to be held at the Stevens Hotel, Chicago, June 15–19.

Six sessions will be devoted to power, four to management problems, three each to aviation, fuels, metals engineering, oil and gas power. Other sessions will be given over to such subjects as machine design, process industries, etc.



Courtesy, Linclon Electric Co.

This modern welding-booth system is employed at Erie Meter Systems, Inc., Erie Pa. Note the overhead outlets and lighting installation

REPAIRED

Punch press frame repair-welded with 52 lb. of 3/8" Tobin Bronze by the Sutton-Garten Company, Indianapolis, Ind. Job took one day for preparation and one day for welding.

RECONDITIONED

This group of worn and broken gears from wire braiding machines was quickly and economically reconditioned with Tobin Bronze Welding Rod.

...by TOBIN BRONZE WELDING

Almost any piece of equipment made of cast iron, malleable iron, steel or copper alloys can be quickly and economically repaired by oxy-acetylene welding with Tobin* Bronze.

Because of the low temperature used when welding with bronze, no serious stresses are set up, there is less chance of warping or cracking and parts can often be welded without dismantling equipment.

For years, this method of bronze welding has been used for reclaiming broken, fractured or worn equipment, or for building up bearing surfaces—at a fraction of the cost of replacement parts.

Write for Publication B-13, containing detailed information on Anaconda Welding Rods, including Tobin Bronze and "997" (Low Fuming). 47171

*Reg. U. S. Pat. Off.

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from mine to consumer

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Improve your Bronze Vertical Welding

... and save maintenance time and welding costs—by using

Phos-Trode

Shielded-Arc Phosphor Bronze Electrodes

Phosphor-bronze hub liners are used between the driving box and wheel hub of locomotives to minimize friction, increase utilization, and reduce wear. Tests show that these liners add many more productive miles to locomotive operation.

Economical installation was the problem. Phos-Trode solved it —

First, because it is unequalled for welding phosphor bronze plate.

Second, Phos-Trode handles easily in the vertical position.

Third, Phos-Trode provides a strong weld (sledge hammer tests broke the parent metal, but couldn't break the weld).

The installation procedure is simple. A section is cut out of the liner so that it can be slipped over the axle. Each section is beveled 45° and welded in position with Phos-Trode. Thanks to its shielded-arc characteristics, Phos-Trode deposits a dense weld—with beads feather-edging perfectly into the base metal, assuring a strong, reliable bond.

This method of installing spacer liners saves considerable time and money. The ease with which Phos-Trode is manipulated; its ability to join dissimilar metals; and its deposit soundness show why it is such a favorite with industry everywhere. See your nearest Ampco distributor and write us for latest bulletins.

AMPCO METAL, INC. is the only manufacturer of a complete line of bronze electrodes for both arc and resistance welding.

AMPCO

Phos-Trode is a product of

Ampco Metal, Inc.

Department WE-6 Milwaukee 4, Wis.

W-99

Conduct Explosive Tests for Welded Ship Plates

BUTT-WELDED plates of rimmed steel plates, when stress relieved at low temperature, proved stronger as-welded plates than in explosive shock tests conducted by the Navy. The explosive, known as NS-D, was confined in contact with the plates by means of a 35-lb carton of sand. The as-welded plates were found to have a failure range of 200 to 210 grams of explosive; the stress-relieved plates failed within the range of 230 to 240 grams. Stress relieving was accomplished by passing a flame at 400 F on both sides of the weld while the weld itself was kept cool with a stream of water.

Additional tests on normalized steel plates showed that stress relief by heating for one hour in a furnace at 1,150 F improved the resistance of the plates to explosive shock. As-welded and torch stress-relieved normalized steel plates had breaking strength ranges between 190 to 200 grams of explosive while the furnace-relieved plates did not fail at any explosive charge below 260 grams. In comparison, "prime" sheet of normalized steel had a breaking strength range of between 400 to 420 grams of explosive.

The Navy research report, "Direct Explosion Test for Welded Armor and Ship Plate; Prime and Welded Plate Tests" (PB-48639) may be obtained for $2 for a photostated copy from the Office of Technical Services Department of Commerce, Washington 25, D.C. Check or money order should be made payable to the Treasurer of the United States.

* *

Welded Utility Units Adopted for Apartments

LAKE BURIEN HEIGHTS, suburb of Seattle, Wash., is the scene of the Pacific Northwest's biggest housing project. Some $5,000,000 is being spent here to provide rental apartments for 544 families. Construction is in the hands of Nettleton & Baldwin, Inc., who will build 44 two-story buildings containing four 3½, 4, 4½ and 5½ room apartments.

Building plans incorporate the Ingersoll welded utility unit for heating, plumbing, lighting, kitchen and bath (see THE WELDING ENGINEER, April, 1946). The standard model utility unit is said to be especially adapted to apartment projects.

* *

Use of Aluminum for Making Automotive Timing Gears

Two years of research has resulted in the development of aluminum timing gears with chemically bonded steel hubs for automotive use. The gears are made by Al-Fin Corp., subsidiary of Fairchild Engine and Airplane Corp., which has developed a process giving a bond with a tensile strength of 6,000 psi. This patented process is said to permit the fabrication of bimetallic assemblies combining selected physical properties of both metals.

ARE YOU STILL AN ACTIVE PARTNER . . .

in this "7½ billion-a-year" success?

NEVER was there a partnership like the nation-wide brotherhood of volunteers who have helped sell, advertise, and promote sales of U. S. Savings Bonds! Their program is the greatest sales operation at the lowest cost in history.

Your continued support in promoting the Payroll Savings Plan will help "America's partnership" this year to repeat or surpass last year's four-star performance, in which sales of Savings Bonds were 7½ billion dollars—*exceeding redemptions by far more than a billion!*

So keep up the splendid work—keep on telling and selling your employees the advantages of Payroll Savings: (1) ease; (2) regularity; (3) safety of investment; (4) security for the individual and the nation; (5) $4 for every $3 at maturity! And, remember, people with a stake in the future are the most stable, most productive employees.

For any help you need in conducting the Plan, call on your State Director of the Treasury Department's Savings Bonds Division.

New Savings Bonds Plan won't affect the P.S.P.

THE Treasury Department and the banks of America are making it possible for farmers, doctors, and other self-employed people to participate in "automatic" Bond buying by special arrangement with their banks. This extension of the Savings Bonds program is not a partial payment plan and is intended *only* for people who are not in a position to take advantage of the Payroll Savings Plan.

The Treasury Department acknowledges with appreciation the publication of this message by

THE WELDING ENGINEER

This is an official U.S. Treasury advertisement prepared under the auspices of the Treasury Department and The Advertising Council.

Now! FASTER! EASIER!

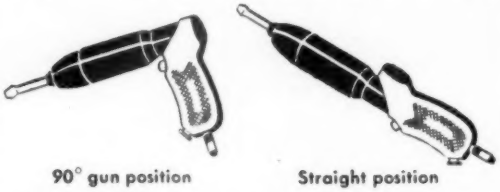
Peening - Cleaning - Scaling

with the NEW
HEAVY-DUTY two-position

salsbury
AIRGUN

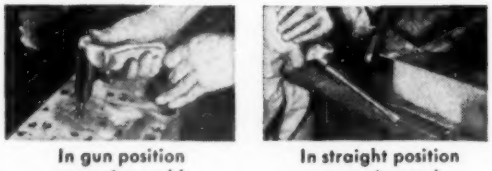
(The only air tool with stroke control)

ONE head, TWO positions! In seconds, head is adjustable in either of two positions to suit work.



90° gun position — Straight position

VERSATILE! Removes slag—valuable on multiple-pass work. Removes rust, paint, scale, etc. It's unequaled for peening!



In gun position—peening weld. In straight position—removing scale.

In any welding operation, the new heavy-duty Salsbury Airgun speeds production—steps up quality—lowers costs.

SAVES TIME! Remarkable two-position head is quickly shifted. Ideal for getting into tight or overhead positions. In seconds, tip is changed to suit type of work.

HIGH OPERATING EFFICIENCY! Handy pistol grip, low weight (4 lbs.) reduce operator fatigue. Controllable striking force assures work uniformity. Operates on 75 to 125 lbs. air pressure, delivering about 5000 strokes per minute. Consumes 5 cf per minute (20 cf compressor is ample).

LIGHT-DUTY MODEL is available for lighter or smaller work. Weighs only 27 ounces—extremely popular on production line operations. No complicated parts! Repays cost in short time and gives years of reliable service. Ask for the Salsbury Airgun at your favorite supplier, or write Dept. 3, The Salscor Company.

THE salsbury AIRGUN

THE SALSCOR COMPANY

1161 East Florence Avenue • Los Angeles 1, California

Install New Machines at Hobart Trade School

HOBART TRADE SCHOOL has recently installed several new machines that keep it abreast of the latest developments in all branches of welding instruction. The gas welding building, which opened last January with capacity for 60 students, added an oxy-acetylene flame-cutting machine that cuts metal up to 6 in. thick. Another new machine in this building is the boiler plate roller used to show students how to make tanks and smokestacks. On the second floor of the main building, heat-treating apparatus has been set up for instruction in this field of metal study as part of the course in welding tools steels. Because graduates meet more and more tool and die steels in their later work, it was decided to give students complete training in the welding of tool and die steels, including heat treatment and hardening by oil, water and air. A vapo-carb unit has also been installed for practice on carburizing.

In order to provide living quarters for its increasing enrollment, a large home has been converted into an attractive and comfortable dormitory. The school now trains an average of 50 men a month, 90% of them former service men.

* *

General Motors Designs Ultra-Modern Train

SCHEDULED to arrive sometime this summer in every large city is the newly designed "Train of Tomorrow" an example of what rail travel could be. This Diesel-powered train is an experimental project of General Motors and its four all-welded cars—diner, chair car, observation lounge and sleeper—were built by Pullman Standard Car Mfg. Co., Chicago.

Visitors to this model train of tomorrow will see many innovations for the comforts of passengers—from Astra domes and mobile telephones to cars with four floor levels and pneumatic door-openers. For those who may be curious about why an automobile manufacturer should be building trains, C. E. Wilson, president of the company, has explained:

"General Motors has no intention of going into the railroad passenger car business. We are interested in the entire field of transportation and, of course, we have special interest in railroads because our Electro-Motive Division is a leading Diesel locomotive builder. We also are interested as suppliers of other equipment to railroads.

* *

Tube Turns Moves Chicago Headquarters

CHICAGO offices of Tube Turns, Inc., have been moved from 327 S. La Salle St. to 904 Fairbanks-Morse Building, 600 S. Michigan Ave. The new and larger offices are the headquarters for George C. Anderson, district manager of the welding and fittings division and Donald A. MacNeil, district manager, forging division.

"Repair time cut about 50%

using Wilson # 200 Aluminum Bronze Electrode"

This 80 lb. cast iron trolley guide, after extreme wear, was restored by the Mack Welding Company of Duluth, Minnesota to original dimensions by arc welding — using Wilson No. 200 electrode.

First, each side of the guide was prepared by machining, then preheated to approximately 400° F with the oxyacetylene flame. Next a carbon steel block, 2½" x 3" x 6", was welded to each side. By keeping the welding current at the minimum, excessive penetration was avoided, and a strong bond was obtained.

With this technique, "Mack" found that no appreciable distortion resulted . . . machining was almost eliminated . . . and repair time was reduced approximately 50% over previous methods.

In general the Wilson No. 200 is used for joining aluminum bronze or other metals and combinations of dissimilar metals. Additional aluminum bronze electrodes in the Wilson line are Nos. 216, 220, 225 and 230. These are frequently used for their properties for nonferrous, hard overlay deposits. The deposits made with these electrodes are corrosion and acid-resistant and range in hardness from 70 to 300 Brinell. All are general purpose D.C. reverse polarity electrodes and are for flat position welding . . . with exception of No. 200 which can also be used in the horizontal position.

For further information on this group of Wilson aluminum bronze electrodes, or any other arc welding electrodes, we suggest you write to the nearest Wilson distributor; or if you prefer fill in and mail to us the coupon below.

WILSON

WILSON WELDER and METALS CO., INC.

General Offices: 60 EAST 42nd STREET, NEW YORK 17, N. Y.

Distributed by: W. P. & R. S. MARS COMPANY: Duluth; KNIGHT & WALL COMPANY: Tampa; ARCOS CORPORATION: Philadelphia, Hartford, Conn.; THE CONGDON & CARPENTER COMPANY: Providence; H. BOKER & CO., INC.: New York, N. Y.; GRAYBAR ELECTRIC CO., INC.: Pittsburgh, Cincinnati; HARRIS CALORIFIC SALES CO.: Detroit; PEABODY SUPPLY CO.: White City, Kansas.

Represented Internationally by Airco Export Corporation

WILSON WELDER & METALS CO., INC. WE
60 East 42nd Street
New York 17, N. Y.
VII

Please send me a copy of Wilson Electrode Catalog ADW 75 together with the latest electrode price list.

Name_____

Firm_____

Address_____

City_____ Zone_____ State_____

when a breakdown ties up a machine

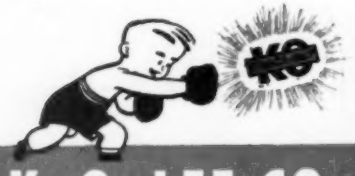
Make Fast Permanent repairs with a **"KNOCK-OUT" A. C. ARC WELDER**

Just roll your "K. O." Welder to the job—make fast, permanent repairs on the spot—save hours, even days, of valuable time.

"Knock-Out" Welders are ideal for production work too, with a wide heat range for efficient welding on sheet or heavy castings. With several models available it's easy to choose one that best fits your needs.

All "Knock-Out" Welders are built of the best materials with the most careful workmanship to give you a machine that will turn out perfect welds day after day.

Ask your "Knock-Out" dealer for details or mail the coupon today.



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ABERDEEN, SO. DAK.
if it's a LEE *it's a* "KNOCK-OUT"

K. O. LEE COMPANY 6
1120 First Ave. S. E., Aberdeen, S. D.
Please send us complete information on "Knock-Out" A. C. Arc Welders.

NAME_____

ADDRESS_____

CITY_____

STATE_____

Low-Temperature Welding Introduced in Java

CIVILIAN experts of the East Java port and naval base of Soerabja will soon adopt the low-temperature welding process for drydock maintenance operations. This method of joining two metals with an alloy of lower melting point was recently demonstrated by officials of Ruhaak and Co., Ltd., Indies representative of a United States manufacturer.

* *

Russia Builds Its First All-Welded Blast Furnace

RUSSIA'S first welded blast furnace will soon go into operation for the Zaporozhye Steel Works, at the Molotov plant in Dneptropetrovsk. Former blast furnaces built in Russia have been riveted. The welded construction saves about 200 tons of metal.

Develop New Tester to Show Steel Hardness

RESEARCHERS at the Kearny, N.J. laboratories of the U.S. Steel Corp. have found a new type of tester to supplement the Brinell, Rockwell and Vickers methods of determining the hardness of a steel sample. The mechanism consists of an indenter with a square base, a 136-deg diamond pyramid penetrator, the mechanical stage for holding the specimen, a microscope capable of magnifying the test field 500 to 1,500 times and a control box. The polished surface of a prepared steel sample is indented with the diamond-point penetrator under a load of a very few grams. A square mark is left which can rarely be seen by the naked eye. The sample is examined under the microscope and the diagonal of the square is measured in microns—thousandths of a millimeter. The hardness is then computed from this measure and the load placed on the penetrator.

* *

McGraw-Hill Opens Buenos Aires News Bureau

McGRAW-HILL WORLD NEWS, subsidiary of McGraw-Hill Publishing Co., Inc., has opened a full-time news bureau in Buenos Aires. It is headed by John Wilhelm, who recently completed three years in Europe for the Chicago *Sun*. While overseas, Mr. Wilhelm was Pulitzer Prize nominee for his series on Britain's economic position.

Trade Names of Resistance-Welding Electrode Alloys and RWMA Specifications

RWMA Types	GROUP A COPPER-BASE ALLOYS					GROUP B COPPER-TUNGSTEN ALLOYS			
	Class 1	Class 2	Class 3	Class 4	Class 5	Class 10	Class 11	Class 12	Class 13
AMPCO[1]	Ampcoloy 99	Ampcoloy 97	Ampcoloy 95	Ampcoloy 86–20	Ampcoloy 92	Ampcoloy 3W1	Ampcoloy 3W10	Ampcoloy 3W20	Ampcoloy W100
COMMERCE PATTERN[2]	Elkaloy A	Mallory 3	Mallory 100	Mallory 73	Commerce H	Elkonite 1W3	Elkonite 10W3	Elkonite 20W3	Elkonite 100W
ELECTROLOY[3]	Electroloy A	Electroloy XX	Electroloy TX	Electroloy B	Electroloy Molin 2	Electroloy 1	Electroloy 10	Electroloy 20	Electroloy 100
MALLORY[4]	Elkaloy A	Mallory 3	Mallory 100	Mallory 73	Elkaloy D	Elkonite 1W3	Elkonite 10W3	Elkonite 20W3	Elkonite 100W
S-M-S[5]	Alloy 101	Alloy 103	Alloy W-5	Alloy W-2	Alloy 116	Alloy 1	Alloy 10	Alloy 20	Alloy 100W
WELDALOY[6]	—	Weldaloy 130	Weldaloy 200	—	—	—	—	—	—
WEIGER WEED[7]	WW-1	WW-2	WW-3	WW-7	WW-8	WW-1W	WW-10W	WW-20W	WW-100W
WELDING SALES[8]	Tuffaloy 88	Tuffaloy 77	Tuffaloy 55	Tuffaloy 44	Tuffaloy 66	Tuffaloy 1W-3	Tuffaloy 10W-3	Tuffaloy 20W-3	Tuffaloy 100W
AVAILABILITY	Bars Forgings	Bars Forgings Castings	Bars Forgings Castings	Bars Forgings Castings	Castings	Bars Inserts	Bars Inserts	Bars Inserts	Bars Inserts

[1] Ampco Metal, Inc., 1745 S. 38th St., Milwaukee 4

[2] Commerce Pattern Foundry & Machine Co., 7450 Melville, Detroit 17

[3] The Electroloy Co., 1600 Seaview, Bridgeport 8, Conn.

[4] R. P. Mallory & Co., Inc., 3029 E. Washington Ave., Indianapolis 6

[5] S-M-S Corp., 1165 Harper Ave., Detroit 11

[6] Weldaloy Products Co., 10213 Harper Ave., Detroit 13

[7] Weiger Weed & Co., 11644 Cloverdale Ave., Detroit 4

[8] Welding Sales & Engineering Co., 8750 Grinnell Ave., Detroit 13

8 MAJOR DEVELOPMENTS .... *by* HARRIS

1 **FIRST** Gas Cutting in U. S. A. * in 1899 by John Harris.

2 **FIRST** exhibit of Torches, Acetylene Convention, St. Louis World's Fair in 1904.

3 **FIRST** Propane Cutting Torches in the World introduced in 1916.

4 **FIRST** "Gasavers" in U. S. A. This device has saved users thousands of dollars through gas economy.

5 **FIRST** "Automatic" Torch in the World. This Torch offers remarkable reductions in gas consumption.

6 **FIRST** Carbide-to-water Portable Automatic Low Pressure Acetylene Generator in U. S. A., making possible substantial savings in Acetylene Gas costs.

7 **FIRST** "Multi-Stage" High Pressure Regulator in the World, producing exceptionally close pressure regulation.

8 **FIRST** Non-Flash, Low Pressure Welding and Cutting Torches in U. S. A. to operate under severe conditions without backfiring.

* Early Foreign Patents on Cutting Torches and the Cutting Process afforded years of virtual monopoly. It was the prior use by Harris that was largely responsible for the invalidation of these patents in the U.S.A. thus greatly benefiting American industry.

The Harris Calorific Company offers a complete line of equipment for the Welding and Cutting Industry. Its Leadership in the field has gained for its products world-wide distribution and acceptance.

The HARRIS CALORIFIC *Co., Cleveland, O.*

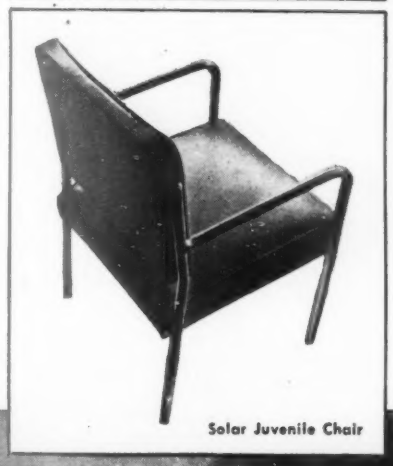
"Give us **Airco's** new Elite aluminum brazing flux and #716 wire **every time** . . . they do a swell job . . ."

says *Mr. Walter O. Schleif, Plant Superintendent, Bell Specialty Manufacturing Company, Inc., Brooklyn, New York*

Used in the manufacture of Solar aluminum furniture at Bell Specialty, Airco Elite Aluminum Brazing Flux and #716 Brazing Wire have more than proved their ability to meet the demand for a high grade, economical brazing alloy, with a satisfactory low melting point. They give excellent results in the fabrication of a wide variety of aluminum products—from cooking utensils and electrical appliances to metal furniture, window frames and other extruded aluminum shapes.

For further information about these two new Airco products, write for a free copy of "Torch Brazing Aluminum"—a new article now being printed. Address: Dept. WE-6140, Air Reduction, 60 East 42nd Street, New York 17, N. Y. In Texas: Magnolia Airco Gas Products Company, Houston 1, Texas. Represented Internationally by Airco Export Corporation.

Solar Step-Up



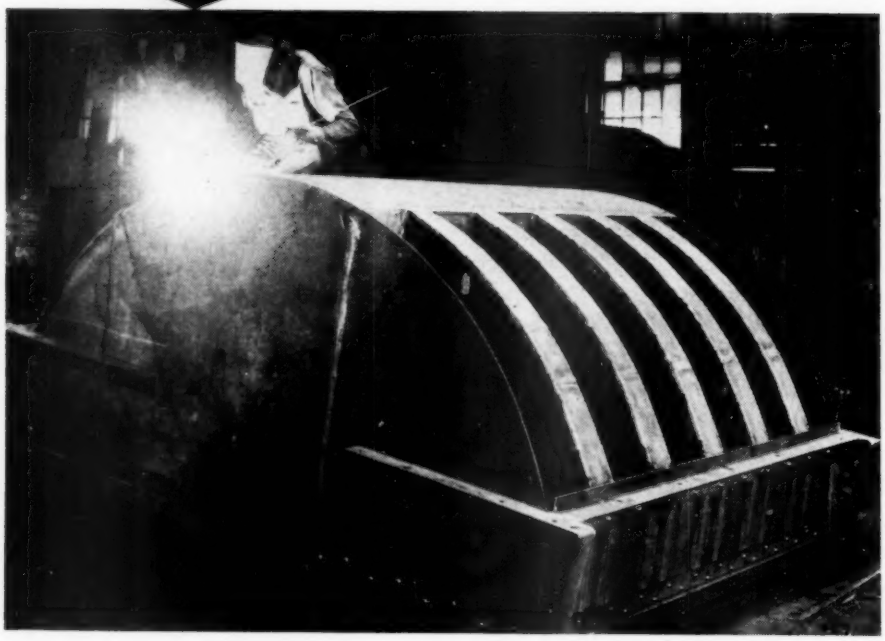
Solar Juvenile Chair

AIRCO **AIR REDUCTION**

Offices in All Principal Cities

Headquarters for Oxygen, Acetylene and other Gases . . . Carbide . . . Gas Welding and Cutting Apparatus and Supplies . . . Arc Welders, Electrodes and Accessories

COPPER CALLS FOR
CARBON ARC WELDING



Courtesy of Hobart Bros. Co.

For better welds at lower cost call for **HOLD-ARK ELECTRODES**

Fabrication of copper vessels and assemblies by the carbon arc method is showing savings up to 90%. Helping to produce important savings in welding costs is an old story with Speer Carbon Hold-Ark Electrodes.

They last 33% longer; give 13% *extra* welds per inch of rod; are 22% harder—stand up to abuse and hard knocks.

Speer Carbon Company puts 50 years' experience into making electrodes of uniform composition, of high current capacity, with better points for faster welds . . . *economical carbon electrodes for you.* In spot, butt, or flash welding, in small precision or large fabrication work, in cutting jobs, Hold-Ark Electrodes will give better welds at lower cost.

Speer
CARBON COMPANY
ST. MARYS, PENNA.

brushes · contacts · rheostat discs · packing rings · carbon parts

CHICAGO · CLEVELAND · DETROIT · MILWAUKEE · NEW YORK · PITTSBURGH

Germans Use Stack Welding for Making Compound Plates

LARGE quantities of compound metal plates were produced for the German chemical industry during the war by stack welding stainless-steel sheets to carbon-steel backing plates. The process is fully described in an OTS report by J. C. Richards of the Australian Scientific and Technical Mission for the British Intelligence Objectives Subcommittee.

The plates are first built up in a pack which is sealed by welding around the edges. Piping is provided to pass a hydrogen atmosphere between the metal surfaces. The welded pack is heated to rolling temperature and is rolled in an ordinary plate mill.

The compound steel plates examined by the investigator averaged about one centimeter (0.39 in.) in thickness and had a stainless-steel sheathing of about one or two millimeters (0.039 to 0.078 in.) It was noted in one instance that the penetration of a plate by shrapnel did not separate the stainless sheet from the plain steel backing.

* *

Paterson-Leitch Passes Thirty-Third Milestone

PATERSON-LEITCH Co., Cleveland, recently celebrated a dual event—the completion of a third of a century in the steel warehousing field and the finishing of a plant addition which will increase manufacturing space by 20%.

A pioneer in arc welding, this company now keeps a crew of some 40 arc weldors to make prefabricated parts such as machine bases, truck frames, ovens, furnaces and material-handling equipment. Steel framework for astronomical observatories is another Paterson-Leitch specialty.

* *

Battelle Institute Expands Electronics Laboratories

INDUSTRIAL and governmental demand for research in electronics has resulted in an expansion of the electronic laboratories of Battelle Memorial Institute, Columbus, O. According to Director Clyde Williams, the expansion was necessary to take care of the growing demand for fundamental and applied research in electronics. Assistance in control and instrumentation problems has been asked of Battelle by industries as diverse as welding, mining, metal products manufacturing, paper making, food processing, and chemical product manufacturing.

* *

Texas Firm Opens New Sales Office

BIG THREE WELDING EQUIPMENT Co., INC., Fort Worth, Tex., a distributor of welding equipment and accessories, has opened a new sales and supply office at 565 W. Commerce St., Dallas. At present the company has sales offices in six of the largest cities of Texas, and plans are being laid to open another office in Beaumont.

Flexible Aluminum Tubing Comes back on the Market

REYNOLDS METALS Co., Louisville, Ky., has resumed production of flexible tubing, a material approved by the American Gas Association for connecting gas appliances to house piping. This tubing, discontinued during the war years, is now being supplied in 2S-0 and 2S-½H aluminum in outside diameters ranging from ¼ to 1⅛ in. Normal weight ranges from 0.026 to 0.257 lb per lineal foot. This is about one third the weight of similar copper tubing.

* *

RWMA Publishes New Manual

AVAILABLE to all users of resistance welding is a new edition the RWMA Resistance Welding Manual, providing technical information concerning the newest developments in this field. The material has been compiled over a number of years by the leading manufacturers and users of resistance-welding equipment. Copies may be obtained at $3 each from the Resistance Welder Manufacturers' Association, 505 Arch St., Philadelphia.

* *

American Welding Expands Plant

AMERICAN WELDING AND MANUFACTURING Co. Warren, O., has purchased from the War Assets Administration a surplus government plant located in this city. The property consists of two main buildings and 14 minor structures located on seven acres of land. The plant, purchased for $200,000 will be altered for peacetime welding operations. As a result of this expansion, American Welding expects to add 100 workers to its present force of 270.

* *

Standardize Symbols for Electrical Drawings

AMERICAN STANDARDS ASSOCIATION announces publication of a master standard, "Basic Graphical Symbols for Electrical Apparatus," consisting of 152 basic symbols for electrical drawings. These are the "building blocks" which, in combination, can be used to describe an almost endless variety of circuits and other devices on electrical diagrams.

The new work standard was sponsored by the American Institute of Electrical Engineers and the American Society of Mechanical Engineers.

* *

Taylor-Hall Grants Export Sales to Do-All

TAYLOR-HALL WELDING CORP., subsidiary of Federal Machine and Welder Co., Warren, O., has granted the the Do-all Co., Des Plaines, Ill., the exclusive right to sell its products in the export market.

The NEW *Chin-Operated...*

BLINKER HELMET

Moving chin down 1/4 inch pulls lever A down so that lenses B drop 3/4 inch, permitting full vision through helmet's clear-cover glass. Raising chin instantly raises dark lenses because of spring C.

- Speeds Up Fit-Up
- Makes It More Accurate
- Leaves Both Hands Free

With the Blinker Helmet, a weldor can tack work in place up to 6 times faster. And the fit-up is more accurate because everything is where he wants it when he strikes his arc. No other helmet offers chin-operation that eliminates tilting to see work. Light. Comfortable. Safe. At your jobber's. Write for descriptive circular!

WELDING APPARATUS COMPANY
2750 WEST VAN BUREN STREET • CHICAGO 12, ILLINOIS
Also Makers of POSITIVE ARC A. C. Arc Welder

Now-a real heavy duty
JUMBO CLAMP

It is the only big clamp we know of that provides for spindle adjustment along the toggle bar.

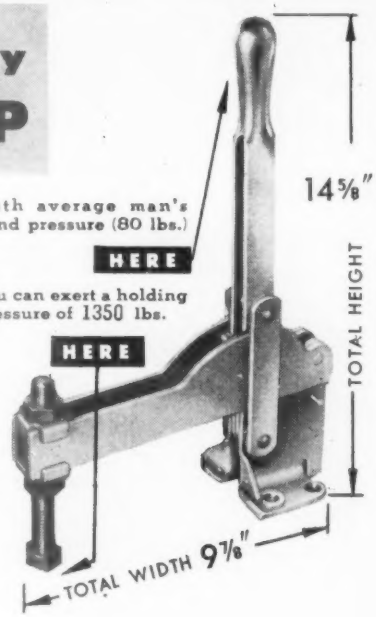
It has a special designed base having an ingenious, integral front corner and back support, making deflection at spindle only 5/32".

Each clamp comes equipped with an adjustable spindle assembly. However, this can be removed and a special pressure pad to suit your requirements can easily be substituted.

The clamp, catalogued as V-1100, has comfortable hand grip. Weighs 6 lbs.

The recommended pressure is 1350 lbs.

As exclusive manufacturers of clamping devices, we do encounter a wide variety of clamping problems. You will find it very advantageous to draw on this extensive experience. Write for catalog showing full Knu-Vise line of clamping devices.



KNU-VISE
INCORPORATED

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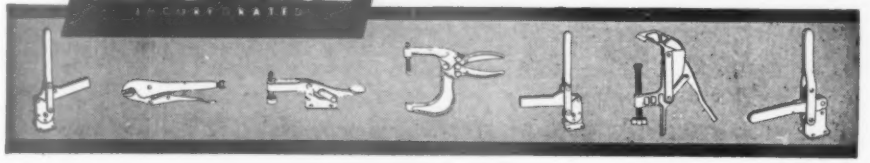
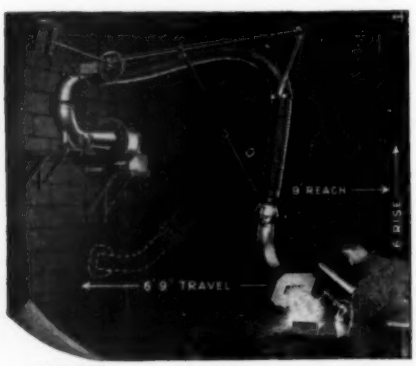


Why the RUEMELIN FUME COLLECTOR *is a* REAL NECESSITY

● *THE OLD WAY*

● *THE NEW WAY*

SOME PROMINENT USERS —
SANTA FE RAILWAY SYSTEM
PENNSYLVANIA RAILROAD
INTERNATIONAL NICKEL COMPANY
JONES-LAUGHLIN STEEL COMPANY
NEW JERSEY ZINC COMPANY
MORGAN-SMITH COMPANY
ANCHOR HOCKING GLASS CO.
SINCLAIR REFINING COMPANY
INLAND STEEL CORP.
OLIVER IRON MINING CO.
NATIONAL LEAD COMPANY
MASSEY HARRIS COMPANY
MARQUETTE CEMENT MFG. CO.
MAYNARD ELECTRIC STEEL CASTING CO.



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TWO MODELS!

- Long reach Model D-5342 — ideal for large welding booths; reaches out 15 feet from wall.
- Standard Model D-5310—used for standard welding booth ventilation; hood reaches out 9 feet from wall.

The Ruemelin Welding Fume Collector has been specially engineered to eliminate noxious fumes. The inlet hood maintains a constant high velocity over the working area, quickly removing heat and smoke *at the source*. Welders equipped with this device are assured of a clean shop atmosphere; the manufacturer gains by increased daily production.

The fume collector hood can be instantly placed where needed anywhere in the booth welding area. No tedious adjustment necessary. Just pull the inlet hood to the welding position and you are ready to go. Approved by state industrial commissions and by compensation insurance companies. Many users send in repeat orders. Write for bulletin 37-C today.

RUEMELIN MANUFACTURING CO.
3880 N. PALMER ST. • MILWAUKEE 12, WISCONSIN
Manufacturers and Engineers of Sand Blast and Dust Collecting Equipment

Magnaflux Sponsors Inspection Conference

About 180 engineering technicians attended a three-day Weld Inspection Conference held at the Congress Hotel, Chicago, May 8–10, under the auspices of the Magnaflux Corp., Chicago. The conference opened under the chairmanship of W. E. Thomas, vice-president in charge of sales, Magnaflux. C. E. Betz, also a vice-president of the company, presented the first paper, which gave a detailed account of latest developments in the magnetic-particle inspection method, first used successfully in 1942 at the Waterton Arsenal. Mr. Betz pointed out that this process of inspection is not really a competitor of radiography. The magnetic-particle method is used to detect surface and shallow subsurface defects, while radiography is employed for deep-seated discontinuities. Mr. Betz presented slides and gave engineering data comparing the many kinds of currents that have been used for magnetic inspection—a-c, d-c, d-c with an initial surge and half-wave d-c.

Chairman W. E. Thomas, speaking on techniques for detecting defects in varying locations, said that the various types of electricity mentioned by Mr. Betz boiled down to two: a-c for surface cracks and half-wave (rectified) d-c to detect subsurface defects. Gray and red magnetic (powders) have been developed as well as fluorescent powder that glows under ultra-violet light.

Concluding the morning session was a professional looking technicolor film, "Weld Inspection with Magnaflux," directed and produced by R. O. Schiebel, Jr., and F. S. Catlin, Jr., midwester district manager and technical coordinator, respectively, for the Magnaflux Corp. This interesting film shows applications of the process and pictures the various components necessary including the magnetizing unit, powder blower, powder spray gun and copper prods.

In the afternoon session, a paper on magnetic-particle inspection in relation to other weld inspection methods was presented by John J. Chyle and A. Cota, director of welding research and engineer in charge of non-destructive testing, respectively, of the A. O. Smith Corp., Milwaukee. This was followed by an open discussion of subject matter presented during the day, answers coming from a panel of the day's speakers.

Friday morning featured three papers from different fields using magnetic-particle inspection. J. W. Owens, director of welding Fairbanks, Morse & Co., Chicago, spoke on machinery weldments with particular emphasis upon Diesel-engine blocks. He was followed by Russell J. Love, executive secretary, pressure vessel research commission, Welding Research Council, who discussed the field inspection of pressure vessels and tanks. In the Long Beach gas holder job, said Mr. Love, 7,000 linear ft of wells were inspected magnetically, 3,000 ft of them in the field.

W. B. Bunn, Jr., welding engineer, M. W. Kellogg Co., closed the morning panel with a paper on high-pressure piping which covered both radiographic

and magnetic-particle inspection methods. Each of the three papers was followed by questions from the floor.

The closing session was devoted to talks by William E. McKenzie, principal welding engineer, U.S. Naval Gun Factory, R.O. Schiebel, of Magnaflux, and A. Robinson, of the General Electric Thomson Laboratory. Mr. Robinson and Mr. Schiebel spoke on the application of "Zyglo," a non-magnetic method of inspection that uses a fluorescent powder to detect surface cracks and other defects that might be invisible to the naked eye.

A visit to the company's plant, 5100 Northwest Highway, Chicago, rounded out this three-day confab. Here visitors saw an actual demonstration of the equipment and methods they had heard discussed on the conference floor.

* *

Wright Forms Non-Profit Research Organization

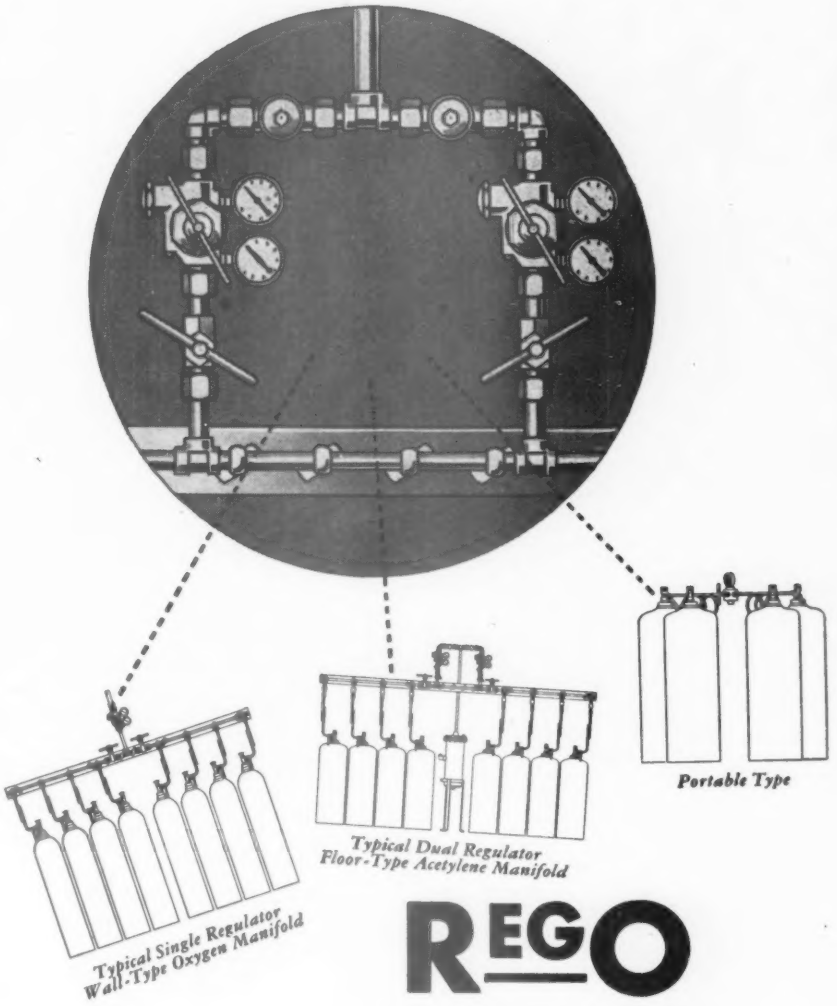
IT is not often that individuals enter business for the welfare of society. However, such is the case with Reverend Joseph S. Wright, a contributor to THE WELDING ENGINEER, who has formed the Colonial Research Co., Jersey City, N.J., a non-profit organization for the advancement of the welfare of the people through scientific research.

Mr. Wright is also currently involved with a national safety campaign sponsored by Shuman's Auto Hospital, Yonkers, N.Y. One phase of this campaign is the promotion of truck grill guards to protect the life of delivery drivers. The latter is illustrated in the photograph reproduced on this page; it consists of 1¼ by ¼ in. steel bar stock bent at right angles and arc welded to form the letters of the word "Cleanart."

Among the welding processes developed by Colonial Research is the welding of white metal, as described by Rev. Wright in an article, "A New Way to Weld White Metal," in the July, 1946, issue of THE WELDING ENGINEER. None of the research company's methods will be patented.

* *

"I got the junk yard almost cleaned up—another hour and we can put up the used car sign again"


Typical Single Regulator Wall-Type Oxygen Manifold
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Unit Construction... The header section of each RegO Manifold is virtually one-piece; extra-heavy seamless brass pipe is run through the forged brass header fittings, the cylinder station shut-off valves and the master shut-off valves . . . all permanent connections are then silver-brazed. The header assembly is bolted to a heavy steel I-beam to assure permanent alignment.

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Extra Convenience... standard RegO Manifold construction provides individual shut-off valves at each cylinder station . . . this design permits any one cylinder to be disconnected without shutting down the entire manifold. Master shut-off valves control each main branch.

Rigid Tests . . . header pipe, valve bodies and fittings withstand pressure up to 10,000 psi and each complete RegO Manifold is subjected to a sustained air pressure test of up to 2,000 psi.

There Is A RegO Manifold to Fit Your Most Exacting Requirements

REGO MANIFOLDS *for* Oxygen • Acetylene • Hydrogen • Nitrogen
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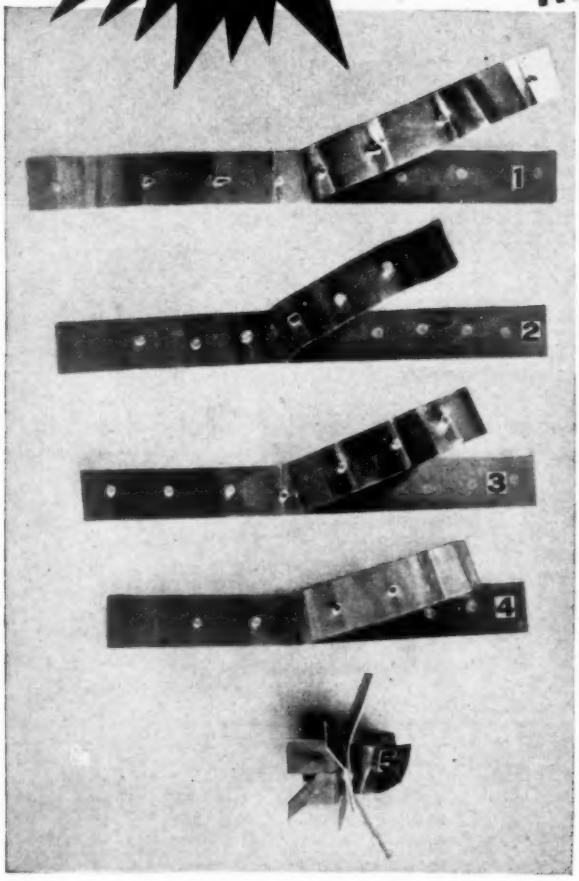
Pioneer and Leader in the Design and Manufacture of Precision Equipment For Using and Controlling High Pressure Gases

now... HIGH STRENGTH Spot Welds in ALUMINUM!



1 2 pieces 35O aluminum .020 thick.

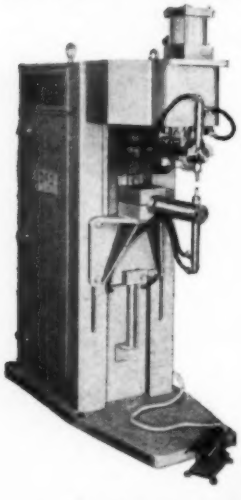
2 2 pieces 52S-½H aluminum .050 thick.

3 2 pieces 3S-½H aluminum .032 thick.

4 One piece 52S-½H aluminum .050 thick to one piece 24SO aluminum .050 thick.

5 5 pieces 52S-½H aluminum each .050 for total thickness .250.

With a *Versatile Acro* WELDER



These welds were made on a standard 50 KVA transformer type A-C operated welder fitted with an auxiliary sequence control. Write us today for interesting information on the complete machine . . . ready for immediate installation in your plant . . . or about converting for aluminum by installing low price sequence controls to your present A-C spot welders.

Distributors! Ask about attractive territory set-up.

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Acro WELDER MFG. CO.

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Open Research Foundation in San Antonio, Texas

AN INTEGRATED "house of science" abundantly equipped with research laboratories was recently opened on a 3,000-acre strip of Texas prairie land eight miles west of San Antonio. The project was made possible by the gift of a valuable oil property by Tom B. Slick, San Antonio oil man and rancher. It consists of two separate but closely associated units—the Foundation of Applied Research and the Institute of Industrial Research, including a development service for inventors.

The Industrial Research division, performing work for corporations on a fee basis, will have departments for petroleum engineering, metallurgy, chemistry and physics. Staffed by engineers and technicians, its facilities will include a laboratory and machine shop, welding, drafting, pattern-making, foundry, forge, and heat treating equipment.

* *

New Tool-Steel Data in '47 Metals Handbook

TWELVE of the nation's technical leaders in the tool steel industry, members of the tool steel committee of the American Society for Metals, have completed their correlation of data in connection with the Society's 1947 Metals Handbook. The seventeen articles included, summarize heat treatments recommended for 50 principal types of tool steels used in industry.

The Metals Handbook, published for the first time since 1940, will be distributed to more than 21,000 ASM members in the U.S., Canada, Europe and Asia.

New Distributors

ALL-STATE WELDING ALLOYS CO., INC., White Plains, N. Y., has appointed: Miller Welding Supply Co., York, Pa., Welders Supply Co., Canton, O., Akron Welding and Spring Co., Akron, Weber-Semmer Co., Pittsburgh, Johnson Welding Equipment Co., Chicago, Montana Hardware Co., Butte, Mont., Solder Supply Co., Boston, United States Welding Works, Denver, Welders Supply & Service Co., Pittsburgh, Welding Supplies, Inc., Birmingham, Ala., Welding Supplies, Inc., Macon, Ga., Maple City Welding Co., Hornell, N. Y., Corinth Machinery Co., Corinth, Miss., National Welding Co., Gloversville, N. Y., Delta Oxygen Co., Memphis, Tenn., McRary & Son, Inc., Asheville, N.C., Sutton-Garten Co., Indianapolis, Welding Sales & Engineering Co., Detroit, Prest-O-Lite Auto Battery and Electric Co., New London, Conn., Keen Compressed Gas Co., Wilmington, Del., North Side Welding Supply, Chicago, Grady's Welding Supply, Burlington, Vt., Contractors Supply Co., Inc., Waterbury, Conn., County Motor Products Co., New Rochelle, N. Y., Bussman's Welding Supply, Klamath, Ore. and Al Thomas, Beverly Hills, Calif.

New Products to Use

Synchronous motor-driven timer for gun welding sheet metal

Timer for Gun Welder

DESIGNED for gun-welder applications, the new class 9052, type FG timer control consists of a synchronous motor-driven cam shaft, two control relays, a low-voltage transformer, and a capacitor breaking circuit consisting of a large condenser, reactor and resistor. All of these components are mounted on an ebony asbestos panel.

In addition to squeeze time, weld interval, hold time and off time, this new timer provides a fifth timing period called "squeeze delay" which makes squeeze times for the first and succeeding welds independently adjustable. This is said to effect a substantial saving in time whenever a long squeeze period is needed for the first weld and shorter squeeze periods thereafter. SQUARE D CO., INDUSTRIAL CONTROLLER DIV., 4041 N. Richards St., Milwaukee 12.

* *

Contour Sander

"SAND-O-FLEX" model 650C is a rotary sander that can be used to finish any regular or irregular surface or edge. Its 12 brush-backed abrasive strips are fed out as needed from an internal cartridge and are forced into, around and over any surface or contour. The abrasive strips are 2½ in. wide and come in various grits and grades, scored or unscored, in both aluminum oxide and garnet cloth. The sander is adaptable to a flexible shaft, electric motor shaft, buffing and polishing lathe, metalworking lathe or any other rotating shaft. It weighs 7½ lb and is enclosed within a 6⅝-in. housing. Overall diameter is 10¾ in. SAND-O-FLEX CORP., 4373 Melrose Ave., Los Angeles.

Cylinder Trucks

A LINE of tandem-type, welded-steel cylinder trucks is available for the transportation of oxygen and acetylene cylinders in tight quarters and narrow aisles. These trucks are made in four different styles: Models LT100 and LT300 provide for front or rear load. The former, 22 in. wide, is capable of carrying a large oxygen cylinder and a medium acetylene cylinder. The latter (LT300) is 24 in. wide and designed to hold two large cylinders.

Model LT200 carries any two standard size cylinders. It is available with either 20 or 30 in. wheels plus a tool tray.

KC50 also has front or rear load and handles a standard or new type small cylinders. Twenty in. steel wheels or 5 in. rubber wheels may be had with this truck. WELDED TRUCK & SPECIALTY CO., 1849 Grand Ave., Chicago 22.

Model KC50 tandem truck carries standard or new small cylinders

* *

Snake Bite Kit

RAPID emergency snake bite treatment for oil field and other construction workers is provided by a new snake bite kit that is only a little larger than a pack of cigarettes and can be carried in a vest pocket. It contains a self-suction pump which can be operated with one hand, a tourniquet, hermetically-sealed iodine brush, a knife with a quarter-inch blade for properly opening the wound, adhesive compress dressing, ammonia inhalents and a tapered-suction pump adapter for application of suction to fingers and toes. MINE SAFETY APPLIANCES CO., Braddock, Thomas and Meade Sts., Pittsburgh 8.

3
HARD FACING ELECTRODES
that give
PERFECT PERFORMANCE

HIGH EFFICIENCY OF DEPOSITION RATE, WITHOUT LOSS OF TIME!

Agile

HARDFACE 250 - HARDFACE 400
HARDFACE 600
WELDING ELECTRODES

DARK-GREEN:—Produces a very hard weld, free from porosity. It is recommended for building-up surfaces and edges damaged by severe abrasion.

RED:—A mild steel electrode that produces a medium hard, wear-resistant, yet machineable weld-deposit for surfaces exposed to abrasion and impact and for the rebuilding of worn parts to their original contour or size.

PINK:—This electrode is easy to apply and economical to use. The slag is porous and light — can be easily removed. The weld deposit can be forged and the welded part can be heat treated.

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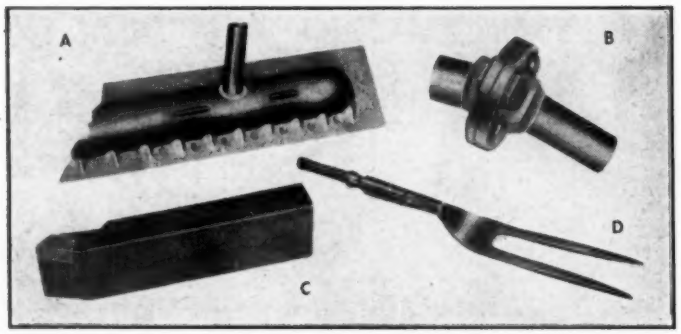
Give Your Production a Lift with APW

NO. 217 SILVER BRAZING ALLOY

APW No. 217 is tops for low temperature production brazing of steel, stainless steel, alloy steel, copper, brass, bronze, Inconel and monel metal. Only small amounts are needed to make clean, sound, leak-proof joints.

Tested and approved by leading manufacturers . . . here are a few typical applications:



A-Stainless Steel & Copper Refrigerator Sub-Assembly. B-Brazed Steel Universal joint. C-Carbide Tool Tip brazed to Shank. D-Stainless Steel Fork Assembly.

APW NO. 217 ALLOY IS FURNISHED IN WIRE COILS, STRIP, SHEET, WIRE RINGS, WASHERS, DISCS AND SPECIAL INSERTS.

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THERE'S AN APW LOW TEMPERATURE SILVER BRAZING ALLOY FOR EVERY PURPOSE

APW No. 369 PASTE FLUX

Gives maximum protection to metal surfaces being joined and actively promotes flow of molten alloy. Easily soluble in hot water.

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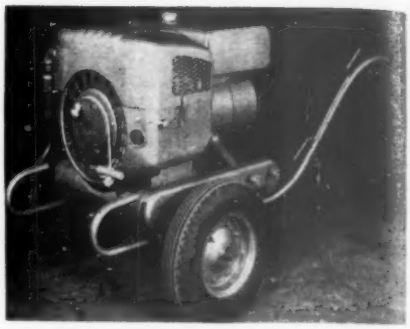
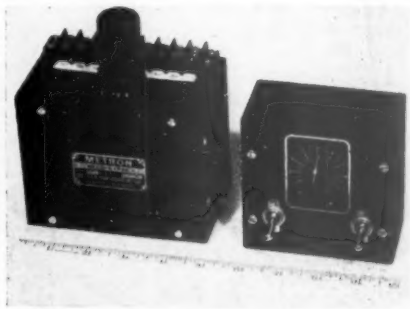


Hollup's new gas driven arc welder

Gas-Driven Arc Welder

A NEW portable gasoline-driven d-c arc welder (Model HGW) offered by Hollup Corp. is said to give excellent arc stability. A gear-type oil pump provides pressure lubrication for main and connecting rod bearings. The frame is of machined rolled steel and may easily be removed. All winding insulations conform to ASA and NEMA specifications. The centrifugal governor is factory-adjusted at 2,500 rpm but may be changed according to the particular demand. HOLLUP CORP., 4900 W. 19th St., Chicago 50.

* *



Welding timer for equipment producers. It has no mechanical components

Welding Timers

TIMING intervals from 1/60 second up to several minutes can be obtained with the Metron electronic welding timer, which employs just one tube and two relays with a control box measuring only 4 by 4 by 2 in. The control box can be bracket-mounted, incorporated in the welder, or screwed to the timer box for mounting as an integral unit. Timing intervals can be provided in one or several continuously variable ranges or adjusted by steps or fixed intervals. METRON INSTRUMENT CO., 432 Lincoln St., Denver 9, Colo.

* *

Brazing Flux

A NEW flux for brazing sheet aluminum is offered by ALL-STATE WELDING ALLOYS CO., 96 W. Post Rd., White Plains, N.Y. Known as "No. 31A," this flux melts at about 950 F and becomes active at 1,000 F; it is said to give good capillary action to the aluminum-brazing alloy. After brazing, nearly all traces of flux residue may be removed by submerging the brazed parts (while still hot) in hot water.

Type "S" portable oxy-acetylene welder with 80 cu ft capacity

Portable Gas Welder

THIS portable oxy-acetylene welding outfit is handy for plant maintenance or repair work in such fields as refrigeration, plumbing, garages, radio and electrical. The frames are constructed so as to completely protect the small-size cylinders and regulators. Two types are available: "Jm" with a capacity of 20 cu ft and "S" with 80 cu ft. The cylinders are approved by the Interstate Commerce Commission and passed by the Bureau of Explosives for Interstate shipment. GELLID ENGINEERING, 20 Lake St., Oak Park, Ill.

* *

Eye Washer

A NEW eye-washing fountain has been developed for the immediate flushing of eyes that have been exposed to irritating vapors, liquids, dusts, etc. This double fountain unit directs two streams of water simultaneously against the eyes. The cast aluminum bowl is designed to fit the upper contours of the face, and the actuating valve is operated by resting the head on the upper portion of the bowl. The entire unit is readily installed in any laboratory, plant or first aid room. BENSON & ASSOCIATES, INC., 332 S. Michigan Ave., Chicago 4.

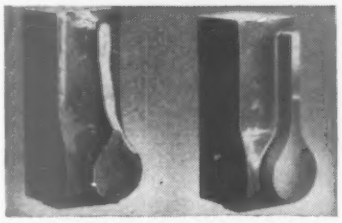
* *

Air-Cooled Transformers

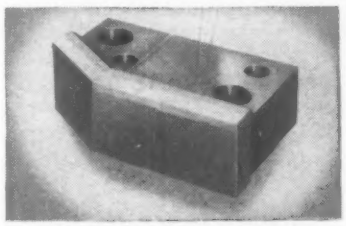
A COMPLETE line of air-cooled transformers has been developed for use with electric furnaces and other applications requiring heavy current. These transformers feature a built-in wiring compartment and terminal board to facilitate ease of installation. Tap switches are available to handle up to 500 amp. Sizes range from 1 to 100 kva, up to 600 volts, single phase, 3 phase or 3 to 2 phase. LINDBERG ENGINEERING CO., TRANSFORMER DIVISION, 2444 W. Hubbard St., Chicago 12.

THE PIONEERS of tool and die WELDING ELECTRODES

. . . can help you save 4 ways



Die unit quickly repaired by welding with Eureka Electrodes. No heat-treat required.



Die unit compositely fabricated with Eureka Electrodes. No heat-treat necessary.

Save many man hours, conserve valuable tools and dies and minimize production delays with the aid of EUREKA TOOL and DIE WELDING ELECTRODES. Here's how it can be done:

1 REPAIRING DIES. . . . Existing units that may fail in operation can be EUREKA welded, either partially or wholly, resulting in a minimum of "down-time."

2 COMPOSITE FABRICATING. . . . Die units can be compositely fabricated, when practical, by EUREKA welding, resulting in numerous advantages.

3 CORRECTING DESIGN. . . . EUREKA welding facilitates making changes in contour, corners or edges during die "try-out" or "change-over" periods.

4 RECTIFYING ERRORS. . . . EUREKA welding permits the correction of errors made in tool and die manufacturing, resulting in great savings.

EUREKA STEELS ELECTRODES FIND THE SPOT

Welding Equipment & Supply Co.

PIONEERS IN TOOL AND DIE WELDING ELECTRODES

225 Leib Street • Detroit 7, Michigan

NEW EUREKA HIGH SPEED STEEL WELDING RODS BULLETIN

Eureka No. 2 High Speed Steel Welding Rods repair high speed steel cutting tools, compositely fabricate, create cutting, wearing or bearing surfaces. Procedures given.

Welding Equipment & Supply Co.
223 Leib Street,
Detroit 7, Michigan

Rush me Bulletin explaining use of No. 2 High Speed Welding Rods.

Name_____

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BUTT WELD *faster*

with a

LARKIN

BA-10, 10 KVA

IF you want *high speed* butt welding—you'll get it from this Larkin Air-Operated BA-10. It welds wire rin,gs rectangles, hoops, squares, wheel rims, and many shapes end-to-end—at the fastest production speed known. This *solenoid-operated* Larkin gives you *perfect alignment . . . instantaneous operation . . . automatic current control . . .* and other features that save time, trouble, repairs. Models from 10 to 50 K.V.A.

SPOT WELDS are FAST welds--with a LARKIN!

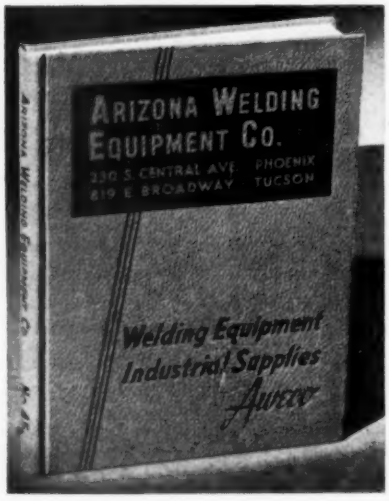
Larkin Spot Welders have solenoid-operated air cylinders which give you *instant action . . . positive control . . . and the fastest work obtainable.* No skidding between tips. Accommodate all types of work. Models from 5 to 250 K.V.A.

There's a Larkin Welder for Every Purpose-Arc, Spot, Projection and Butt

Write for Prices and Full Details Now to

LARKIN LECTRO PRODUCTS CORP., 166 W. 146th ST., NEW YORK 30, N. Y.

Photologue--------FOR WELDING CATALOG SERVICE



The Arizona Welding Equipment Co.'s catalog of Phoenix and Tucson, Arizona.

Customers of Photologue comment on the cooperation received and the individual approach given to the compilation of each catalog.

Photologue Catalogs are compiled to . . . represent clearly your merchandise to the welding trade . . . advertise your products to regular and potential customers . . . sell your products economically.

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CATALOG PUBLISHERS

610 W. VAN BUREN ST. - - - - - - - CHICAGO, ILLINOIS

"Speedframe" goggles enable the worker to keep his hands free at all times

Quick-Adjusting Goggles

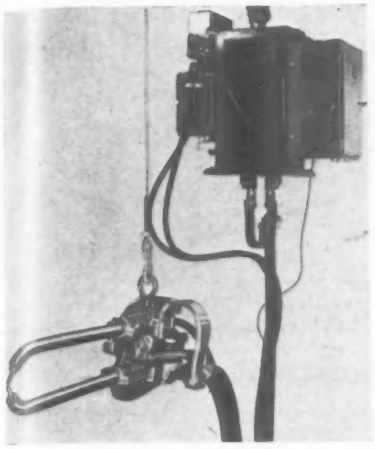
"SPEEDFRAME" self-adjusting weldors' goggles are raised or lowered at a nod of the head, enabling the weldor to keep his hands free for the work. The outfit consists of a pair of goggles with correctly shaded lenses mounted in a fiber head frame which holds them securely in position without uncomfortable pressure on the temples or on the bridge of the nose. The assembly is adjustable in three directions by side and top straps and is held in position by a screw-type clamp. "Speedframe" is available with both weldors' or chippers' lenses—with or without cover glasses. MINE SAFETY APPLIANCES Co., Braddock, Thomas and Meade Sts., Pittsburgh 8.

* *

Arc starting material eliminates "freezing," operator tension, etc.

Arc-Starting Powder

RECOMMENDED for arc applications (a-c/d-c) where low open-circuit voltages and low current values are employed is an arc-starting material designed to provide an artificial current-carrying path between the electrode and the work before the transfer of the first molten droplet takes place. The operator needs only to dip the tip of his electrode into the magnetically charged powder or insert the electrode tip in a muff (for other than downhand welding). Only a pinch of the compound is needed when using the powder form. The arc lasts only as long as the substance—from this stage on arc stability depends on the electrode coating, open-circuit voltage and amperage applied. ELECTRICAL ENGINEERING Co., 335 Lemcke Building, Indianapolis, Ind.



Portable air-operated gun welder has a kva rating ranging from 30 to 75

Portable Gun Welder

A ROCKER-type model of a portable gun welder is offered by EISLER ENGINEERING CO., 740 S. 13th St., Newark 3. This air-operated spot welder consists of an air-cooled transformer with an 8-tap switch (7 "on," 1 "'off"), a pneumatically or electronically actuated timer and a high speed electronic contactor. The welding cycle is initiated by foot switch or push button. Cylinder arrangement permits welding in ordinarily hard-to-get-at places. Horns are interchangeable to fit throat depths ranging from 8 to 24 in.

* *

High-Manganese Electrode

"FROGALLOY" electrodes are recommended for building up or welding high-manganese or high-carbon steels. Applications include switch points, frogs and crossing in the railroad industry, wobblers, spindles and other rolling-mill equipment and in general wherever a work-hardenable, wear-resistant weld deposit is desirable.

There are two types of this electrode: M (E-973) and C (G-87). "Frogalloy M" is for steel castings containing from 12.0 to 14.0% manganese. The latter has been developed for the welding of high-carbon, heat-treatable castings or machined carbon steel assemblies, as well as high-carbon, high-manganese steel plates. Both types produce a sound, uniform deposit that permits multiple build-up without cross-checking or cracking, states manufacturer. Peening is neither required or recommended. In most cases, no preheat is necessary. THE MCKAY CO., 1005 Liberty Ave., Pittsburgh 22.

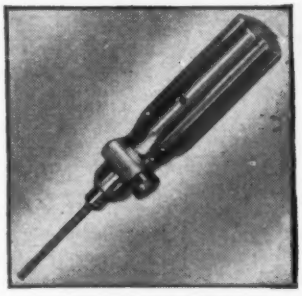
* *

High Tensile Electrode

CAPABLE of high speed welding on grooved joints, positioned and horizontal fillets is a new Westinghouse electrode that conforms to AWS-ASTM tentative specifications for iron and steel arc welding classification E-7020. Designated as DH-MO, it is available in four diameters ranging from 5/32 to 1/4 in. WESTINGHOUSE ELECTRIC CORP., Pittsburgh 30.

New Type of Torque Tools Incorporate Spring Clutch! . . . Are 98% Accurate!

Acme Torque Wrench and Screw Driver both incorporate spring clutches, with easily operated control. After setting control to desired torque, the operator merely turns tool in the usual way. When the torque required to drive the threaded part exceeds the pre-set value, the tool slips. Impact doesn't cause driving torque to increase. Oil doesn't affect setting which is reproducible within 2% or better.



Torque Screw Driver

The Wrench offers right and left-hand drive, ratchet action and withdrawal. Spring clutch may be set from 0 to 500 inch pounds. Standard sockets are interchangeable. The Screw Driver may be set for any value of torque from 0 to 35 inch pounds. A ratchet action is incorporated. The same tool will also withdraw screws. Standard bits, including socket types, may be easily inserted. The tool is made of pressure cast aluminum.

Another Time-Saver on the job, is chewing gum. The act of chewing aids the workers' concentration—seems to make the work go easier. Chewing gum may be used even when workers' hands are busy; reducing interruptions from the job. For these reasons many plant owners have made Wrigley's Spearmint Gum available to everyone.

You can get complete information from
Acme Scientific Company,
1450 W. Randolph St., Chicago 7, Ill.

AB-66

Fuse-Well
Cast
Welding Rods

THE STANDARD OF QUALITY
Throughout the World

CAST ALUMINUM
WELDING RODS
OF STANDARD ANALYSIS

PLAIN AND ALLOYED GRAY IRON
WELDING RODS
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THE CHICAGO HARDWARE FOUNDRY CO.
Dependable Since 1897
647 ENGINEERING BUILDING
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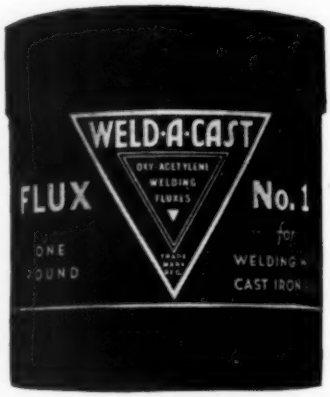
WELD-A-CAST
OXY ACETYLENE WELDING FLUXES

Ask your dealer — or write



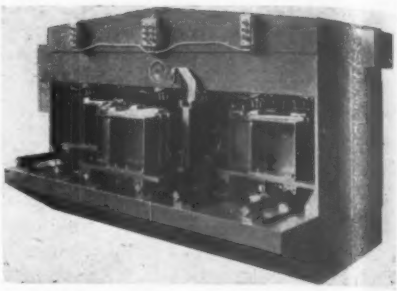
The Old Brand is Still the best

No. 1. For Welding with Cast Iron Rod.

No. 3. For Brazing and Bronze Welding.

No. 4. For Welding Cast Aluminum.

CORTLAND WELDING COMPOUND CO.
Cortland, N. Y.



"Speedframe" goggle enable the worker to keep his hands free at all times

Multi-Transformer

SMALL individual transformers have been set in a spot welder to render it capable of producing some 300 steel drawers per hour in one particular application. This welder has three separate units, performing identical operations on three sizes of drawers. Each unit has six 14-kva transformers, each taking care of two welds in series. Depending on power available, all guns in one unit can weld simultaneously, independently or in sequence. PROGRESSIVE WELDER Co., 3050 E. Outer Drive, Detroit 12.

* *

Electrode Holder

MARTIN WELLS "Rod Saver" electrode holder is now adaptable for silver-brazed cable connections. Silver brazing is said to be almost as simple as soft soldering and to provide greater amperages and cooler operation. The silver-brazed connection will outlast the life of the cable, claims manufacturer.

A small copper disc supplied with the Rod Saver makes the new type of connection possible. Directions for the silver brazing are supplied with each holder. MARTIN WELLS Co., 5886 Compton Ave., Los Angeles 1.

* *

Tubular Micrometers

TUBULAR structure of the new "Tumico" micrometers is said to afford greater measuring accuracy because of the 50% reduction in weight. These hollow micrometers are available in various types: the conventional ranging up to 24 in.; the blade-type for measuring narrow depths up to 4½ in., roller mill micrometers in various types: the conventional ranging up to 24 in.; the blade-type for measuring depths up to 4½ in., roller mill micrometers in 3 or 6 in. throat depths, etc. TUBULAR MICROMETER Co., St. James, Minn.

* *

Cleaning Tank

FASTER and more thorough removal of oil and grease from metal parts is claimed for the Turco Turbulator tank. This automatic, cold-tank cleaner utilizes a new principle of liquid flow action. Actuated by air volume, pressure differential and gravity, it cleans parts with a combined scrubbing and solvent action. There are four models of the tank, handling everything from a typewriter to the largest Diesel motor block. TURCO PRODUCTS, INC., 6135 S. Central Ave., Los Angeles 1.

"HW-4" Heliarc torch is water-cooled and has a ceramic insulating cup

Heliarc Torch

A NEW, water-cooled Heliarc torch (HW-4) is recommended for inert-gas-shielded manual arc welding of such metals and alloys as stainless steel, aluminum, Monel, Inconel and magnesium. This torch has an adjustable tungsten electrode and a ceramic cup to direct the shielding gas (helium or argon) to the weld area. Water cooling makes it possible to use a lighter weight flexible power cable. The cooling water flows through the insulated handle and out around the supply cable, which is capable of carrying a current of 250 amp. Should the water stop flowing, a safety fuse in the water discharge line shuts off the power to protect the torch against overheating. Direct current, straight or reverse polarity, or high-frequency-stabilized alternating current can be used with this equipment. THE LINDE AIR PRODUCTS Co., 30 E. 42nd St., New York City 17.

* *

Abrasive-Belt Grinder

A UTILITY grinder provides the advantages of abrasive-belt grinding for general purpose uses. All of the wear is on the belt, which operates over a resilient contact roll or wheel. The wheel remains flat, square at the sides and maintains its diameter and balance. For grinding and polishing certain rounded or oval parts, an additional resilient contact roll can be attached to the grinder in place of the platen normally provided above the first roll. The unit is adjustable 90 deg, permitting grinding to be done in either the horizontal or vertical position. PORTER-CABLE MACHINE Co., Syracuse, N. Y.

* *

Electrode for Cast Iron

A HIGH-NICKEL core wire (Wilson No. 575) with a heavy extruded coating has possible application wherever welding is to be done on cast iron. This all-position a-c/d-c electrode is particularly applicable in the automotive field for castings requiring machinable welds. Ordinarily, preheating is not necessary. The deposit is said to be machinable, ductile, free from cracks or porosity and of adequate tensile strength for cast-iron welding. Wilson No. 575 is available in $\frac{3}{32}$, $\frac{1}{8}$ and $\frac{5}{32}$ in. diameters. WILSON WELDER & METALS CO., INC., 60 E. 42nd St., New York City 17.

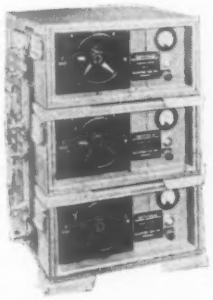
NEW MODEL UP

LF Induction Heater

For convenient portability & versatile application

Preheating and Normalizing for Welding
1, 2, 3 units 10, 20, 30 kva.

by the Smith Dolan System



STACKED UNITS for diverse applications

Developed primarily for its flexibility and adaptability to a wide range of applications and capacities. This unit eliminates the necessity of stocking a number of heaters in several capacities to handle large and small work. A minimum amount of equipment is necessary. The individual units of 10 kva. each may be stacked on the job to form groups of 2 and 3 units with capacities of 20 and 30 kva., to obtain necessary capacities.

Extremely compact, it is especially useful in a limited space and crowded conditions where it can be kept close to the work. Each unit is complete in itself, containing power unit, contactor, meters and control supply. Heating current and voltage output variations are brought about by an ingenious selector switch built into the unit and readily accessible. Dimension of the units are 23" wide—23-½" deep and 10" high. Weight 250 lbs.

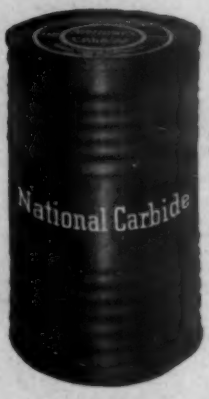
Other uses: Thawing large water lines. Testing high current power bus connections. Testing current transformers. Supplying phantom loads for testing relays on power systems. Resistance heating for brazing and soldering. Shrink-fitting. Heating for straightening. Drying water soaked rotors and stators.

Detailed Information supplied on request without obligation.

ELECTRIC ARC, Inc.

152 Jelliff Avenue **Newark 8, N. J.**

manufacturers of **Dualarc DC Welders • Spot Welders • Nuarc & Alternarc AC Welders • & Smith Dolan Induction Heaters**

National
Carbide
EFFICIENT
ECONOMICAL
DEPENDABLE
for
Welding and Cutting
SPECIFY


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CHEK-SHOCK OXYGEN CUSHION VALVE
SOFTLY controls the vicious "jolt" of high pressure oxygen gas, thus eliminating regulator repairs and preventing possible injury to operators.

- Will allow tank valve to be opened rapidly without damage to regulator or danger to operator.
- Will increase life of regulator assembly.
- Will eliminate possible injury to operator from burstings.
- Will prevent unnecessary internal wear in regulator (*as NOT necessary to release control screw before opening tank valve*).

PRICE IS LESS THAN ONE REPAIR BILL ($6.00 EA.)

#1. STANDARD COUPLER . . . for all standard size welding type oxygen regulators.
#2. LIGHT COUPLER . . . for "airplane" or soldering size oxygen regulators.
#3. HEAVY DUTY COUPLER . . . recommended for extra heavy duty work only.
#4. SCREW TYPE COUPLER . . . for removable inlet stem regulators (¼" pipe) available in standard, light, or heavy capacities.
#5. POR HYDROGEN . . . left hand thread coupler.

We also Make MEDICAL CHEK-SHOCKS for All Types of Medical Regulators and Tank Fittings (chrome plated) . . . $8.00 Ea.

SEE YOUR DISTRIBUTOR OR WRITE—

Chek-Shock MFG. CO.
FOWLER, CALIF.

About People

NORMAN ARNOLD NIELSON, metallurgical engineer in the engineering research laboratory of E. I. Du Pont de Nemours Co., has been awarded the 1946 Young Authors Prize by the Electrochemical Society of Wilmington, Del. Mr. Nielsen was co-author with DR. E. M. MAHLA, group supervisor of the materials construction section at the Du Pont experimental station, of the prize winning paper, "Passivation of Stainless Steel."

* *

Three new district managers have been appointed by Air Reduction Sales Co., New York: They are HERMAN VAN FLEET, JR., New England district which encompasses the states of Maine, Vermont, New Hampshire, Rhode Island and part of Connecticut; L. A. HAMILTON, Seattle district including Washington, Montana and northern Idaho; EMMETT W. MAC CORKLE, Portland district supervising southern Idaho and Washington in the vicinity of Walla Walla.

* *

ARTHUR D. BROWN, formerly manager of the Allis-Chalmers Los Angeles district office, has been named manager of the company's Washington D.C. office. R. N. LANDRETH, who has been acting manager of this office, will devote full time to his duties as assistant to W. C. JOHNSON, vice-president of the general machinery division. A. D. ROBERTSON, formerly assistant manager of sales engineering of the electrical section at the Norwood, O. works, has been appointed manager of the Tampa, Fla., district office.

* *

DR. GEORGE R. HARRISON, dean of the school of science, Massachusetts Institute of Technology, has been elected chairman of the American Institute of Physics. He succeeds DR. PAUL E. KLOPSTEG, director of research, Northwestern University of Technological Institute.

* *

DR. C. E. MACQUIGG, dean of engineering, Ohio State University, has been appointed a member of the consulting staff of the Taylor-Wharton Iron and Steel Co., Easton, Pa.

* *

PAUL H. HOLTON has been appointed Atlantic district manager for Carboloy Co., Inc., Detroit. His headquarters are located at 1060 Broad St., Newark. PAUL SCHICK succeeds Mr. Holton as sales engineer for the Philadelphia branch office.

* *

W. B. PEIRCE, vice-president in charge of research at the Flannery Bolt Co., Bridgeville, Pa., has been elected president of the American Society of Tool Engineers.

BERNARD H. LORD, has been appointed district manager of Ceco Steel Products Corporation's New Orleans office. Walter E. Lord, formerly with Concrete Steel Co., Minneapolis, has been named Milwaukee district manager. He replaces W. O. RICHARDS, who has been promoted assistant manager of the Chicago office. LESTER R. WISE has been appointed manager of the company's merchant trade division located in Chicago.

* *

GEORGE HOHMANN has been promoted Chicago district manager of the McKay Company's electrode division. Mr. Hohmann brings to his position a broad experience in the welding industry, together with an intimate knowledge of the needs of the midwestern industrial markets. He is a member of the American Welding Society.

* *

LESTER M. GOLDSMITH, chief engineer for the Atlantic Refining Co., Philadelphia, has been awarded the decoration "for exceptional service with the Office of the Chief Engineers during World War II. Mr. Goldsmith was very instrumental in the installation of an oil-pipeline under the English Channel preceding the invasion of Normandy—the famed "operation Pluto."

* *

ALBERT E. ZEISEL has been appointed vice-president in charge of sales for Eutectic Welding Alloys Corp., New York City. Mr. Zeisel is a member of the New York Section of the American Welding Society and the St. Louis chapter of the American Society of Metals.

* *

HERMAN A. GRISHKAT has been appointed district manager in northern New York and Berkshire County, Mass., for Federal Machine and Welder Co. In addition to taking over the line of Federal resistance welders, Mr. Grishkat will continue to serve as district manager in the same territory for Warco Sales Co., subsidiary of Federal.

* *

ISAAC HARTER, formerly vice-president and director of the Babcock & Wilcox Co., has been elected chairman of the board of the Babcock & Wilcox Tube Co., Beaver Falls, Pa.

* *

LEE W. DELHI, president of the American Welding Society, has been named a director and vice-president of California Steel Products Co., Richmond, Calif.

* *

GEORGE J. READ, formerly director of economics for Consolidated Edison Co., N.Y., has been named general manager for Chelsea Products, Inc., Irvington, N.J.

* *

WALTER A. JAYME has been appointed assistant general superintendent of National Tube Company's Gary, Ind., works.

- One piece, molded, sturdy fibre construction.
- No rivets to tear, loosen or burn out.
- No possibility of electric shock.
- Deep molded design for maximum protection.
- Absolutely light-proof.
- Unusually comfortable.
- Quick adjusting, molded fibre headgear.
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- Also available in handshield and lift-front types.

MODEL M-1250

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WELDER'S HELMET

Practical, high quality protection. Dockson designed for maximum comfort, safety and economy.

Write for our complete welding and safety catalogs.

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Without a Dependable MIXER You Haven't Got a GOOD TORCH!

When a torch has a mixer that will function with dependable efficiency, using tip sizes 00 to 12 inclusive . . . compensating for both welding gas pressures and welding tip sizes—and one that will produce a *longer, hotter* flame, using the same gas pressures, you may be sure that *that* torch is trade-marked MECO.

Make your own comparison to prove our claims—a demonstration is all you will need.

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Weldit Automatics

WELDING TORCH W-45. Strong and sturdy, 14 inches long, yet light in weight—only 17 ounces. Has lock control for continuous welding. Cuts oxygen and acetylene cost ⅓.

BLOWPIPE C-46. Has good balance . . . Comfortable grip . . . Closed hand releases gas . . . Open hand cuts it off . . . Reduces idle flame fire hazard . . . Works perfectly with natural gas, manufactured gas, butane and compressed air.

WELDING TORCH W-46. Has long lever for closed hand or finger-tip gas release or cut off. Allows wider operation range. Weight 14 ounces, length 13 inches.

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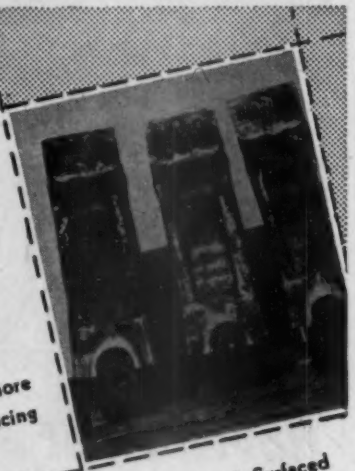
11% to 13½% Manganese Nickel Steel

APPLICATOR (Filler) BARS

ROLLED ROUNDS, SQUARES, FLATS

SEACO HARD FACING WELDING ELECTRODES

Wears as long as the more expensive hard surfacing electrodes



for resurfacing broken and worn down 11% to 14% Manganese and Carbon Steel parts

Can be applied to any steel surface to give extremely high resistance to abrasion and absorb heavy impact. Can be deposited in 1 or 2 layers with second layer usually being hardest.

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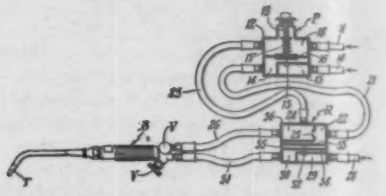
91 N. J. Railroad Avenue. NEWARK 5, N. J.

From the Patent Office

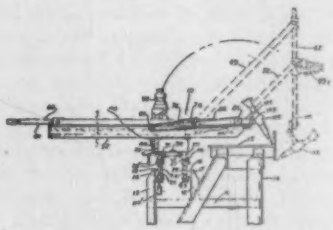


Gas Flame Regulator

2,416,161 EIBE W. DECK, Plainfield, N. J., assigned to UNION CARBIDE and CARBON CORP., New York City. Filed June 12, 1942. Issued February 18, 1947.

Apparatus for regulating a heating flame produced by the combustion of fuel gas. A gas having a relatively high oxygen content is mixed with a stream of gas having a relatively low oxygen content to form an initial mixture. The proportion of gas having a high oxygen content can be varied as can the pressure. There are also means for throttling the flow of the initial mixtures, means for simultaneously varying the pressure of fuel gas, means for throttling the flow of the fuel gas and means for mixing the initial mixture with fuel gas to form a combustible mixture. The proportion of oxidizing gas having a relatively high oxygen content may be increased, the pressure of oxidizing gases may be increased, and the pressure of fuel gas may be increased simultaneously to produce an increase in the heating effect of the flame.

* *



Flame-Cutting Machine

2,416,384 EMERY A. GIBSON, Olympia, Wash. Filed July 11, 1945. Issued February 25, 1947.

A flame-cutting machine comprising a carriage, a turntable, a pivoted rack bar for carrying the torch, means for acuating the bar to raise and lower the torch and means for longitudinal movement of the bar. The last means is a motor hingedly mounted adjacent to the bar, including a gear adapted to mesh with the rack. A segmental gear actuates the pivotally supported mount for the bar said support and forms an inclinometer. The carriage has a calibrated surface and the turntable a pointer operating over the calibrations.

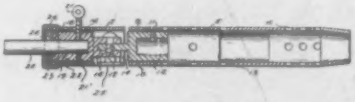
Gas Cooled Spot Welding

2,416,374 PAUL E. BRUNBERG, Detroit, Mich., assigned to NITA CAROL BRUNBERG, Detroit. Filed October 9, 1941. Issued February 25, 1947.

A method of cooling and protecting the electrode and work in spot welding by conducting a compressed, non-oxidizing gas to the interior of a hollow electrode during passage of the welding current. The gas is allowed to expand when it reaches the electrode interior thus cooling the electrode body. It is then conducted to the welding and discharged into the atmosphere, thus permitting further expansion to cool the tip and the work.

The welding electrode comprises a body with a hollow interior, a supply line providing a refrigerant connection near the outer end of the electrode by means of a very small orifice which permits the first stage expansion of the refrigerant, a welding tip with a hollow interior connecting with the hollow interior of the body of the electrode. Tip has one or more restrictive jet openings directed toward the work and the welding area and arranged to direct and confine refrigerant passing through the openings. The area of the jet opening or openings is somewhat larger than the inlet orifice at the other end of the electrode, permitting a second-stage expansion to cool the tip and the weld. The use of a neutral gas as a refrigerant, provides a non-oxidizing atmosphere during the welding.

* *



le ctrode Holder

2,413,213 WILLIAM E. CARDINAL, Cherry Lake, Fla. Filed Aug. 30, 1944. Issued Dec. 24, 1946.

An electrode holder comprising a handle and a head section, including sleeves of insulation material. A pair of sockets of conductive material enclosed in these sections are adapted to respectively receive a cable and a welding rod. Projections on the sockets in one end of the sleeve are included in the head section, and these are pivotally connected by a pin to provide for movement of the head on the handle. The pin is enclosed in the sleeve included in the head section. An insulation collar in the other end of the sleeve contains a flared opening for guiding the electrode into the socket.

* *

Antifogging Composition

2,416,254 RICHARD L. GILBERT, JR., Old Greenwich, Conn., assigned to AMERICAN CYANAMID CO., New York City. Filed February 24, 1945. Issued February 18, 1947.

A method of inhibiting the formation of fog on a lens by coating it with a thin anti-fogging film. The latter contains a di-(3,7-dimethyloctyl) sulfosuccinate as the principal anti-fogging agent together with a water-soluble gum.

A-LUM-ITE

WELDS WHITE METAL

BRAZES ALUMINUM ALLOYS

Large Stock-No Priority-Prompt Delivery

A-LUM-ITE is the ideal gas rod for the welding of white metal (die cast) and the brazing of aluminum alloys.

Uniformity, high tensile strength, machinability and ease of application (without the use of flux) are the real reasons A-LUM-ITE is winning the confidence of welders everywhere.

A-LUM-ITE is available in standard sizes: 1/8", 5/32", 3/16", 1/4" and complete assortment. Full instructions are furnished with each pound. Write or phone for free literature and samples.

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TANK CARRIER*

DESIGNED FOR

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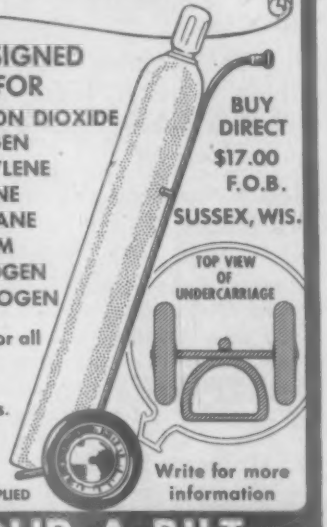
A size for all Bottled gas products.



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*PAT. APPLIED

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WELDING AND BRAZING FLUXES

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1. TIME SAVING 2. QUALITY PRODUCING 3. PERMANENCE IN RESULTS 4. COST REDUCING

★ When you are welding or brazing get the advantages of METAL BOND products. A type for every need. Each delivers quality results more easily and inexpensively.

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"FLUXINE" Fluxes are the result of over fifty years of scientific research into the metal-joining field. There are 89 FLUXINE Fluxes . . . one for every welding, silver soldering, brazing, and soft soldering operation . . . each with its own properties, designed for a particular metal-joining operation. All have been perfected not only for highest efficiency, speed, and long life, but for economy and safety as well. FLUXINE Fluxes cause no injurious fumes to irritate eyes or nose of the operator.

So confident are we that wherever a metal-joining operation is required FLUXINE Fluxes will do it better, faster, and more economically than any competitive fluxes, that we will be glad to have you try it at our expense.

Write on your company letterhead for a generous sample and directions for using FLUXINE Fluxes.

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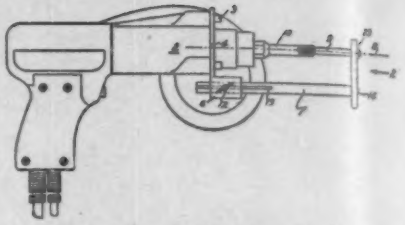
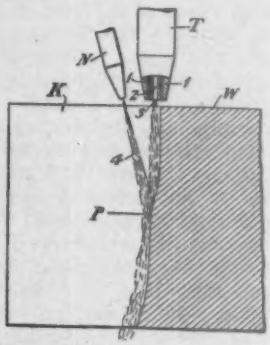


Stud Welder

2,416,915 CHARLES S. EVANS, Atherton, Calif., assigned to TED NELSON, San Leandro, Calif. Filed July 6, 1945. Issued March 4, 1947.

In a gun for welding a stud within an enclosing ferrule, a chuck for carrying the stud and a chuck for carrying the ferrule. The support for the ferrule chuck is mounted on the gun and positioned to one side of the stud chuck.

* *



Powder-Cutting Method

2,415,815 GEORGE M. DEMING, Orange, N. J., assigned to AIR REDUCTION SALES CO., INC., New York City. Filed August 17, 1945. Issued February 18, 1947.

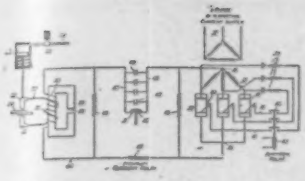
In this method of flame-cutting, an oxygen cutting jet is directed against the metal being cut while it is at kindling temperature. Finally divided metallic particles are fed into the oxygen stream. These particles have an oxygen-resistant coating of sufficient thickness to prevent combustion until they are subjected to the heat of the cutting operation.

* *

Multiple-Arc Circuit

2,417,907. HUGH S. BOWEN, SR., Fairfield, and JAMES A. SMITH, JR., Birmingham, Ala. Filed Nov. 16, 1943. Issued March 25, 1947.

In arc-welding apparatus, at least two welding circuits arranged in parallel with each other and connected to said current source. An electrode is arranged in each circuit for simultaneous welding. Other elements are relay contacts in one line of each circuit, a choke coil in shunt with the relay contacts in each circuit and a relay coil in series with each parallel circuit. Each relay coil is so constructed as to close the relay contacts in one of the other parallel welding circuits when the coil is energized and to open the relay contacts when the coil is de-energized. The choke coil in one circuit absorbs the overload which would otherwise be imposed on the electrode circuit upon breaking one of the other welding circuits.



Circuit Interrupting Device

2,416,669 DAVID SCIAKY, Chicago, Ill., assigned to WELDING RESEARCH, INC., Chicago. Filed January 31, 1944. Issued March 4, 1947.

This patent pertains to a method of resistance welding in which energy is stored electromagnetically. The steps consist in connecting the primary winding to a d-c source to cause a charging current to flow until a preset maximum is reached, rapidly interrupting the flow of current to prevent ionization of the medium surrounding the contacts at the interruption, providing a parallel circuit of condenser capacity in shunt relation with contacts to avoid arcing and reducing the inductance of the condenser circuit by locating the interrupting means beyond the condensers. The charging current must flow past the terminals of the condensers and then through the interrupting means, which prevents the condensers from discharging back into the d-c source. The condenser discharge current is shunted through a resistance path connected across the terminals of the primary circuit so that the discharge current may flow through the primary winding.

* *

Torch Holder Assembly

2,416,399 JAMES D. MCKIERNAN, Brooklyn, N. Y., assigned to AIR REDUCTION SALES CO., INC., New York City. Filed October 7, 1943. Issued February 25, 1947.

Improvement for a torch holder assembly for gas cutting or welding machines. It includes an electric motor carried by the torch holder, a clutch operatively connected with the motor, an axially movable shaft section to which the driven part of the clutch is connected, a pinion on the shaft section and a rack on the torch meshing with the pinion. A spring yieldingly urges the shaft in a direction to engage the clutch whereby the torch may be raised and lowered in the holder by the motors. The shaft section may be moved axially to disengage the clutch or rotated to raise or lower the torch by hand.

* *

Electrical Soldering Iron

2,416,370 CLARENCE O. BARSTAD, Minneapolis, Minn. Filed August 28, 1945. Issued February 25, 1947.

An electrical soldering device having an elongated tubular body and a pistol-grip handle through which a strip of solder is passed, feeder means for the strip of solder and a thumb piece for operation of the feeder. A finger piece is arranged with a linked lever connection with the thumb piece whereby thumb and finger piece may be jointly manipulated or either manipulated individually for the feeding of the strip of solder.

Yes, sir, NI-ROD electrodes get rid of welding problems . . . but fast!*

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- No. 8 Aluminum Flux for Sheet Aluminum
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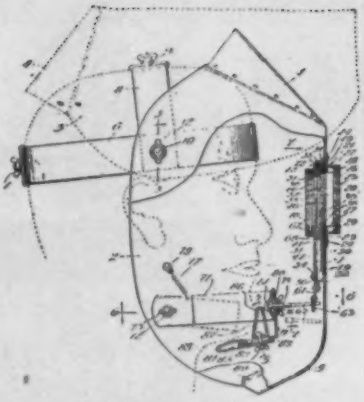
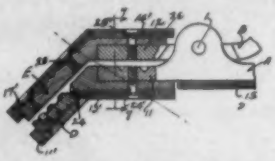


Weldor's Helmet

2,416,764 HAROLD ROY MADSON, Glen Ellyn, Ill., assigned to WELDING APPARATUS CO., Chicago, Ill. Filed January 1, 1944. Issued March 4, 1947.

A weldor's helmet comprising a head harness, a shield having a window with a movable lens and a chin-operated lever pivotally connected to the shield and to the movable lens. A lens-operating lever pivotally connected to the window structure and to the movable lens means, and a connecting member between the lens-operating lever, and the chin-operated lever moves the lens with a proportionately greater movement than the movement of the chin-operated lever.

* *



Electrode Holder

2,416,872 JOSEPH U. GARIBAY, Montebello, Calif. Filed October 25, 1943. Issued March 4, 1947.

Jaw extension means for a welding electrode-holder. It comprises a pair of pivoted elements, each formed with a body and a handle portion extending in one direction from the pivot of said elements and a jaw extending in the opposite direction. The jaws are disposed in parallelism one above the other. One of the two electrode-gripping members has a rear extension for engaging against the bottom face of the lower jaw and a shoulder for engaging against the outer end. The other member has a rear extension for engaging against the upper face of the upper jaw, and a shoulder for engaging against the outer end of the upper jaw. Each of these members has a downwardly inclined electrode-gripping portion. The lower one of these portions is provided with a plurality of transverse notches of varying sizes in its work face, whereby a plurality of round electrodes of varying sizes may be selectively and securely gripped, one at a time, between the inclined portions. An insulating shield encompasses approximately all of both inclined portions except their work faces and narrow areas of adjacent sides. Each of the inclined portions and its associated shield may be fastened as a unit to the associated jaw of the holder.

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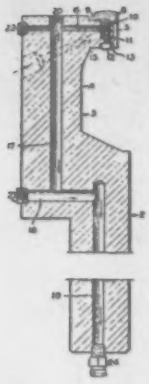
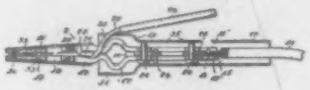


Resistance-Welding

2,416,365 JOHN J. WISLER, Columbia, Pa., assigned to ARMSTRONG CORK CO., Lancaster, Pa. Filed December 2, 1944. Issued February 25, 1947.

An electrode body having an offset projection of relatively narrow cross-section in which is formed a chamber having an opening in the top thereof to receive a welding tip. The chamber also has an opening in the bottom to accommodate an attaching screw for the tip. A conduit enters the chamber at a point adjacent the bottom, and a second conduit enters at a point adjacent the top. These conduits supply cooling fluid and discharge from the chamber. The welding tip has a substantial portion closely adjacent the upper conduit opening and closing the top opening of the chamber. An attaching screw passes through the bottom opening of said chamber and engages the attaching means formed on the tip in order to hold the latter in firm engagement with the offset projection.

★ ★



Electrode Holder

2,416,841 FRANK J. NOWICKE, Hanover, Md. Filed June 19, 1944. Issued March 4, 1947.

An electrode holder comprising a pair of identical jaw members having electrode-receiving jaw ends and cable-receiving securing ends connected to the jaw ends by resilient bowed portions. A perforated insulating handle extending about the cable-receiving securing ends has a belled portion extending forwardly about the resilient bowed portions of the jaw members; the belled end is flattened and perforated on its sides and slotted at its top and bottom, a cam member located between the jaw members adjacent the bowed portions is operated by a lever to separate the jaws to electrode-receiving position, the lever extends through one of the slots of the belled end of the insulating handle. An extending toe on the lever beyond the cam fits to prevent accidental rotation of the lever. A spacing bar separates the cable-receiving ends of the jaws. A metal fastening member is clamped between the ends of the cable to provide a good electrical and mechanical connection between cable and electrode holder.

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Speeds up high-quality production spotwelding of light metals. Easy to operate, economical to buy.. Straight vertical plunger action—air operated—electronically timed. Rated 3 KVA, handles two thicknesses *18 gauge* C.R.S. or equivalent. Compact, 21″ high, 23″ deep, 10″ wide. Write for Bulletin 200 AB or catalog on complete line from 1 to 7.5 KVA.

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- 752-R, 752-P Air operated (Floor Style) 7½ KVA

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Contract Awarded

Arizona—NATURAL GAS PIPELINE—El Paso Natural Gas Co., Bessett Tower, 17 mi. 6 in. natural gas pipeline from main line to near Morenci, force account. $170,000.

Contracts Awarded

Calif., El Segundo—BOILER HOUSE, etc.—Standard Oil Co. of Calif., El Segundo, constructing portion boiler house and installing 2 large steam boilers at El Segundo Refinery, to Vinnell 325 Co., W. E. Segundo Blvd. Approx. $350,000.

Low Bidder

†**Calif., Muroc**—WATER SUPPLY, etc.—U. S. Eng., 751 S. Figueroa St., Los Angeles, Apr. 25, water supply, distr. lines, pump house, and ground storage tanks at Muroc Army Air Field, Ser. No. 47-30, from Edward R. Siple Co., 2545 San Fernando Rd., Los Angeles. $194,361.

Contract Awarded

Fla., Fort Pierce—PIPING—City, Fort Pierce, installing piping in municipal electric plant addn., to Crawford Sprinkler Supply Co., East Point, Ga. $139,897.

Low Bidder

Ind., Evansville—STEEL TANK—Bd. Water Works Trustees, City Hall, Mar. 31, elevated steel tank, Div. F, from Chicago Bridge & Iron Co., 1305 W. 105 St., Chicago, $82,300; feedermains, Div. G, from Ryan Constr. Co., 402 Court Bldg., $149,791.

Low Bidder

La., New Orleans—GAS SERVICE SYSTEM—Housing Authority of New Orleans, 226 Carondelet St., Apr. 17, installing gas service sys. on St. Bernard Ave. Proj., from Emile M. Babst Co., 1050 Camp St., $254,283.

Contract Awarded

Oklahoma—CRUDE OIL PIPELINE—Sunray Oil Corp., Allen, 7½ mi. 6 in. crude oil pipeline carrier between Allen and Canadian River, to Pipe Line Service Co., Seminole. $67,000.

Low Bidder

†**Oregon**—PIPELINES—Bureau Reclamation, Bend, Apr. 7, concrete structures, steel pipelines for Willow Creek siphon and waterway in North unit, Main Canal, Deschutes Proj., Spec. 1719, from Morrison-Knudsen Co., Inc., 319 Broadway, Boise, Idaho. $195,161.

Low Bidder

†**Pennsylvania**—WATER SUPPLY SYSTEM—U. S. Eng., 925 New Federal Bldg., Pittsburgh, Zone 19, water supply sys. for Crooked Creek Dam, Ford City and Tionesta Dam, Tionesta, Inv. W-36-058-eng-47-114, from Bass Eng. & Constr. Co., 215 Birmingham Theater Bldg., Birmingham, Ala. $43,000.

Contract Awarded

★ **Tennessee and Kentucky**—GAS PIPELINE—Tennessee Gas & Transmission Co., Commerce Bldg., Houston, Tex., 82 mi. 26 in. welded joint natural gas pipeline main between Greenbriar, Tenn. and Franklin, Ky., to Morrison Bros., Constr. Co., Inc., P. O. Box 4106, Odessa, Tex. Approx. $4,822,000.

Contract Awarded

★ **Texas and Colorado**—REFINED PRODUCTS PIPELINE—Phillips Petroleum Co., Bartlesville, Okla., and Shamrock Oil & Gas Co., Shamrock Tex., 215 mi. (1st sect.) 658 in. o.d. refined products pipeline between Borger, Tex., and La Junta, Colo. to H. C. Liles Constr. Co., 3600 V. Rena St., Oklahoma City, Okla. $3,325,000.

Contract Awarded

★ **Texas**—CRUDE OIL MAIN—Gulf Refining Co., Pipe Line Div., Gulf Bldg., Houston, 105 mi. 8 and 10 in. loops crude oil main between Midland and Lufkin, to Latex Constr. Co., M & M Bldg., Houston. Approx. $1,960,000.

Contract Awarded

★ **Texas**—PRODUCTS PIPELINE—Magnolia Pipe Line Co., Magnolia Bldg., Dallas, 178 mi. 12¾ in. products pipeline between Beaumont, Spindle Top and Hearne, Jefferson Co., to Smith Contg. Co., Beaumont. Approx. $4,125,000.

Contract Awarded

★ **Texas**—WELDED JOINT PRODUCTS PIPELINE—Shell Pipe Line Corp., Shell Bldg., Houston, 102 mi. 6 in. welded joint products pipeline between Sheridan and Deer Park (near Houston), to Smith Contg. Co., c/o F. A. Smith, 317 W. Thomas St., Houston. $1,185,000.

Contract Awarded

★ **Tex., Pasadena**—REFINERY PLANT UNITS—Sinclair Refining Co., Gulf Bldg., Houston, 4 story, 100x300 ft., rein.-con., brick barrel house, addnl. expansion refinery plant units and housing of heat exchangers, etc., crude oil pipe still, to Fluor Corp. Ltd., 2500 Atlantic Bldg., Los Angeles, Calif. Approx. $7,000,000.

Contract Awarded

†**Washington**—PIPELINES—Bureau Reclamation, 7½ Second St., Yakima, discharge pipelines and outlet structures for 16 pumping plants on Roza Div. of Yakima Proj. Spec. 1588, to Scheumann & Johnson, Johnson Lloyd Bldg., Seattle. $773,131.

Contract Awarded

★ **Wyoming and Colorado**—PIPELINE—Wyco Pipe Line Co., Casper, Sect. 1, constructing 132.84 mi. 8 in. products pipeline between Casper, Wyo., and point 40 mi. north of Cheyenne, Wyo., to Allred-Enix Constr. Co., Oil & Gas Bldg., Fort Worth, Tex., approx. $1,960,000; Sect. 2, 127.16 mi. 8 in. products pipeline between 40 mi. north of Cheyenne, Wyo., and Denver, Col., to Pacific Pipeline & Engineers Ltd., c/o owner, Casper, Wyo., approx. $1,-800,000.

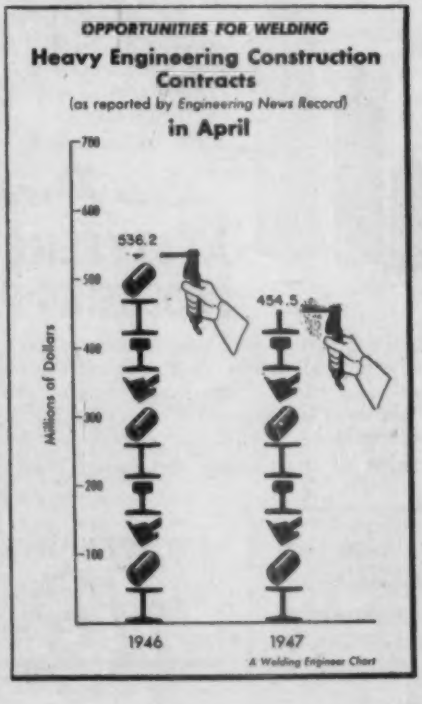
Contract Awarded

★ **Wyo., Casper**—REFINERY PLANT—Socony-Vacuum Oil Co., Inc., White Eagle Division Refinery, Casper, modernization, expansion refinery, to Catalytic Constr. Co., c/o Hiudry Products Corp., Casper T. Elwood, Webster, pres. Approx. $3,500,000.

CANADA

Contract Awarded

Ont., Windsor—PIPE LINE—Union Gas Co. of Canada, Chatham, installing 6 mi. pipe line from Detroit River to Howard Ave. plant to Shaw Constr. Co., 530 S. Vidal St., Sarnia. $200,000.



LATIN AMERICA

Contract Awarded

Colombia, Barranca Bermeja—PIPELINE—Tropical Oil Co., Bogota and Barranca Bermeja, 63 mi. 6 in. products pipeline between Barranca Bermeja, along Magdalena River to Puerto Berrio, approx. $1,000,000; pump station, 25 mi. south of here, $110,000. Owner builds. Floyd E. Warterfield, Jr., pres. Oklahoma Eng. Co., c/o owner, engr.

Structural Bridges and Others

Low Bidder

Alabama—BRIDGES—State Hy. Dpt., Montgomery, Apr. 4, bridges 0.048 mi. Coosa Co., from Phillips Constr. Co., Ashland, $50,139*** 0.084 mi. Blount Co., from W. A. McWaters, Bell Bldg., Montgomery, $74,753*** 0.051 mi. Tallapoosa Co., from Baird & Latimer Co., Selma, $52,782*** Cleburne and Calhoun Counties, Proposal B, from Goodwyn & Murphree Co., Troy, $58,090.

Contract Awarded

Arkansas—BRIDGES—State Hy. Dpt., Little Rock, bridges in Phillips Co., to W. R. Aldrich Co., Kalurah University Gardens, Baton Rouge, La. $87,902. Bids 4/25.

Low Bidder

California—BRIDGES—State Div. Hys., Sacramento, Apr. 9, bridges in Stanislaus and San Joaquin Counties, from Frederickson & Watson Constr. Co., 873 81 Ave., Oakland, $341,807*** San Joaquin Co., from A. A. Edmondson & A. L. Miller, 1715 7 St., Sacramento, $159,072*** Fresno and Kings Counties, from Clay Bennett Constr. Co., 514 Bryan St., Palo Alto, $141,867.

Low Bidder

California—BRIDGES—State Div. Hys. P. Wks. Bldg., Sacramento, April 2, bridge in Madera Co., from Dan Caputo, 945 Delano, San Jose, $78,799; in Colusa Co., from Lord & Bishop, Box 812, Sacramento, $136,165.

Contract Awarded

California—State Div. Hys., Sacramento, bridge, Contra Costa Co., to Duncanson Harrelson Co., 1404 DeYoung Blvd., San Francisco. $226,434. Bids 3/26, awarded 4/15. Low Bidder reported W. E., May, p. 106.

Contract Awarded

Calif., San Francisco—BRIDGE—City and San Francisco Co., Dpt. P. Wks., City Hall, constructing Evans Ave. Bridge, to Eaton & Smith, 715 Ocean Ave. $67,500. R. Wadsworth, City Hall, city engr. Awarded 4/16.

Low Bidder

Connecticut.—BRIDGES—State Hy. Dpt., Hartford, Mar. 31, bridges in Cheshire-Southington, and East Hartford, from Brunelli Constr. Co., 19 Main St., Southington, $67,630 and $178,624 respectively*** East Hartford, from Savin Constr. 10 Village St., East Hartford, $225,346*** Manchester, from Alex Jarvis Co., 6 Dover Rd., Manchester, $144,147*** Clinton, from Mariani Constr. Co., 222 Forbes Ave., New Haven, $57,145.

Low Bidder

Connecticut—BRIDGES—State Hy. Dpt., Hartford, Apr. 21, bridges in East Hartford and Vernon, from Brunalli Constr. Co., Main St., Southington. $114,492 and $158,841 respectively.

Low Bidder

★ †**D. C., Wash.**—PIER, etc.—U. S. Eng., 1 and Douglas Sts. N. W., Zone 25, Apr. 24, constructing Pier 4, incl. bulkhead wall, etc. along Maine Ave., Potomac River, Washington Channel, Serial W-49-80-47-67-(17)C, from Lipsett, Inc., 80 Wall St., New York, N. Y. $746,729.

Low Bidder

Fla., Coral Gables—BRIDGE—City, Apr. 1, bridge on Hardie Rd., from Powell Brothers, 16 S. W. First Ave., Fort Lauderdale. $41,000.